FEBRUARY, 1927

Railway Engineering and Maintenance

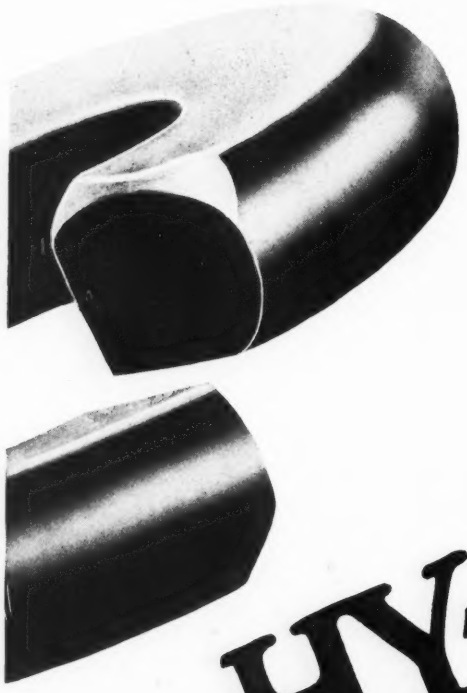
Buried But Operating

WHEN tracks are buried for months under ice and snow, you do not have to see your track joints to know that they are absolutely tight. The super strength of IMPROVED HIPOWER permanently maintains the bolted security of track joints, eliminates loose joints and prevents deterioration.

When spring comes, IMPROVED HIPOWER, the active member of the joint, will be found doing full duty, entirely free from rust because it is *Parkerized* and cannot corrode.

The National Lock Washer Co.
Newark, N. J., U. S. A.

IMPROVED HIPOWER



Deflected HY-CROME SPRING WASHERS

Hy-Crome does not depend upon a cutting edge to hold either nut or rail joint permanently tight — their non-fatiguing spring action amply provides this essential tension.

You can now buy Hy-Crome Spring Washers with deflected "end edges". They have this advantage: the deflected washer can be instantly removed without possibility of cutting the surface of either nut or fish plate and without the danger of "springing" the washer beyond its original inside diameter.

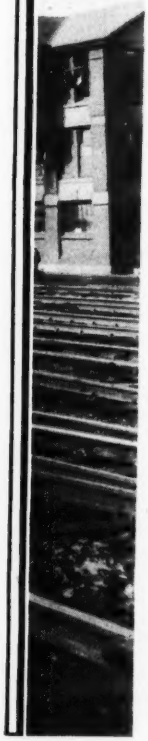
Hy-Crome Spring Washers when compressed present a tight flat surface against nut and plate that prevents water from working in and setting up corrosion.

Testimony to the success of Hy-Crome is found in countless records established wherever a comparison of actual service results have been made.

THE RELIANCE MFG CO.
MASSILLON, OHIO

NEW YORK, CLEVELAND, DETROIT, CHICAGO
ST. LOUIS, SAN FRANCISCO

N. S. Kenney, Munsey Bldg., Baltimore, Md.
W. & A. C. Semple, Louisville, Ky.
Engineering Materials, Ltd., McGill Bldg., Montreal, Quebec, Canada



RAILWAY ENGINEERING AND MAINTENANCE
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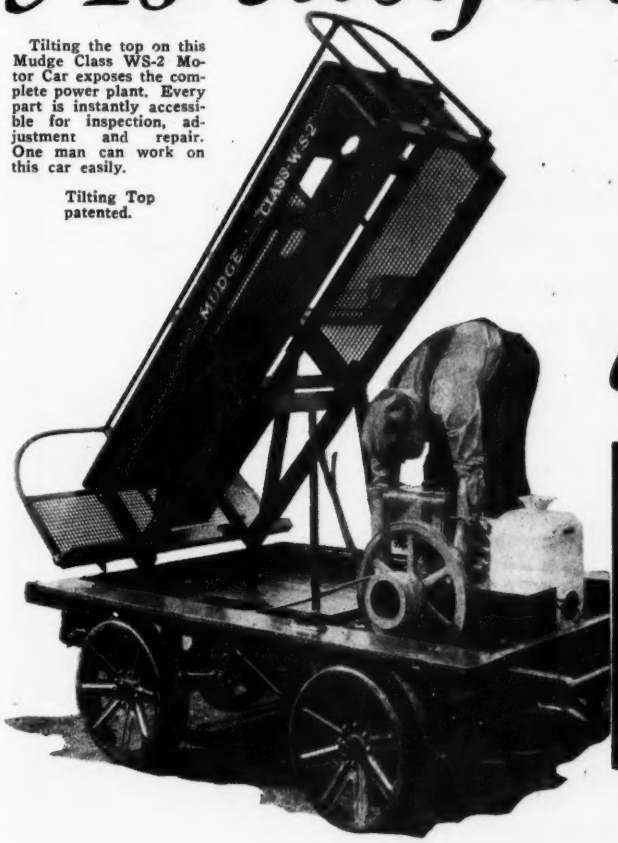
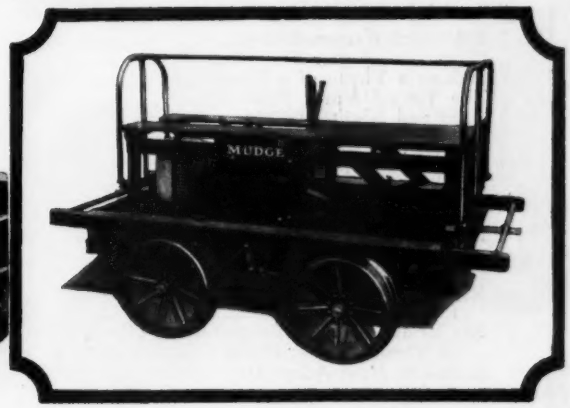
Alphabetical Index to Advertisers, Page 64 Classified Index to Advertisers, 62-64

As easy as raising the hood of an automobile

Tilting the top on this Mudge Class WS-2 Motor Car exposes the complete power plant. Every part is instantly accessible for inspection, adjustment and repair. One man can work on this car easily.

Tilting Top patented.





THIS labor and time saving feature was originated by Mudge engineers in line with the company's policy of providing every practicable improvement in motor cars. It is an exclusive feature embodied in both the WS-2 standard section car and the WS-3 heavy duty car.

Mudge Cars are noteworthy for the practical character of their special features. A Mudge design can be recognized by its basic simplicity, ruggedness and all around dependability.

Mudge Cars seldom need attention but even this emergency is provided for in the simple arrangement illustrated above.

We manufacture a complete line of railway inspection and section cars; side drive or center load; direct connected or free running; air-cooled or water-cooled motors.

Mudge & Company

Manufacturers—Railroad Equipment
Railway Exchange Bldg. • CHICAGO

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Railway Engineering and Maintenance

Formerly the Railway Maintenance Engineer

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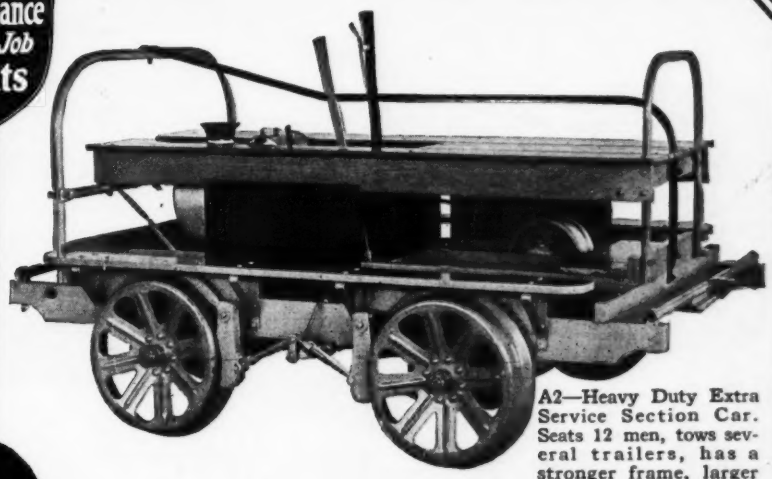
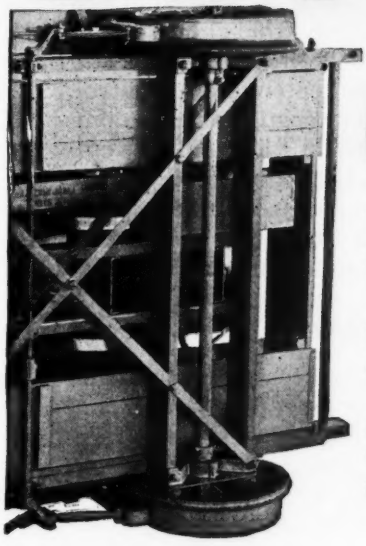
Performance on the Job Counts



A2—Heavy Duty Extra Service Section Car. Seats 12 men, tows several trailers, has a stronger frame, larger bearings and 1¾-inch axles.

Rugged Construction



Tens of thousands of dollars yearly have been saved for Class A railroads by the rugged construction of the thousands of FAIRMONT cars they use.

Note the channel steel cross members, quadruple steel sway brace truss, rigid square design, select white oak axle sills, strongly ribbed castings.

Also note that FAIRMONT frames are easily repaired in the field, due to use of cut thread bolts double-nutted or secured with lock washers or cotter pins — no rivets to work loose and send car to the shop for reaming and hot riveting.

FAIRMONT RAILWAY MOTORS, Inc.
FAIRMONT, MINNESOTA

District Sales Offices
NEW YORK CHICAGO ST. LOUIS SAN FRANCISCO
WASHINGTON, D. C. NEW ORLEANS WINNIPEG, CANADA

BALDWIN LOCOMOTIVE WORKS, Foreign Representatives

Fairmont
RAILWAY MOTOR CARS

Factory and Laboratory Control Insure Strong, Dense Concrete

ONE of the important reasons for the permanence and economy of Massey Concrete Cribbing is the quality of concrete used in the two simple units of which these walls are built.

In monolithic wall construction many conditions affecting quality are difficult or impossible to control. Massey factory made concrete is not subject to these variations. It is produced under uniform conditions and with the best facilities. Skilled workmen handle all operations, supervised by men of long experience in concrete construction.

By means of a competent engineering staff with a well-equipped testing laboratory the character of materials used and the actual mixing practice are under constant control. Analysis of materials, actual compression tests on 6″x12″ concrete cylinders, and a monthly check of the amount of cement used at each plant in proportion to total output are among the more common means for insuring the maintenance of the Massey standard of quality.

Send us the necessary information on any retaining walls you are considering and let our engineers prepare a layout and cost estimate covering a Massey Cribbing Wall.

MASSEY

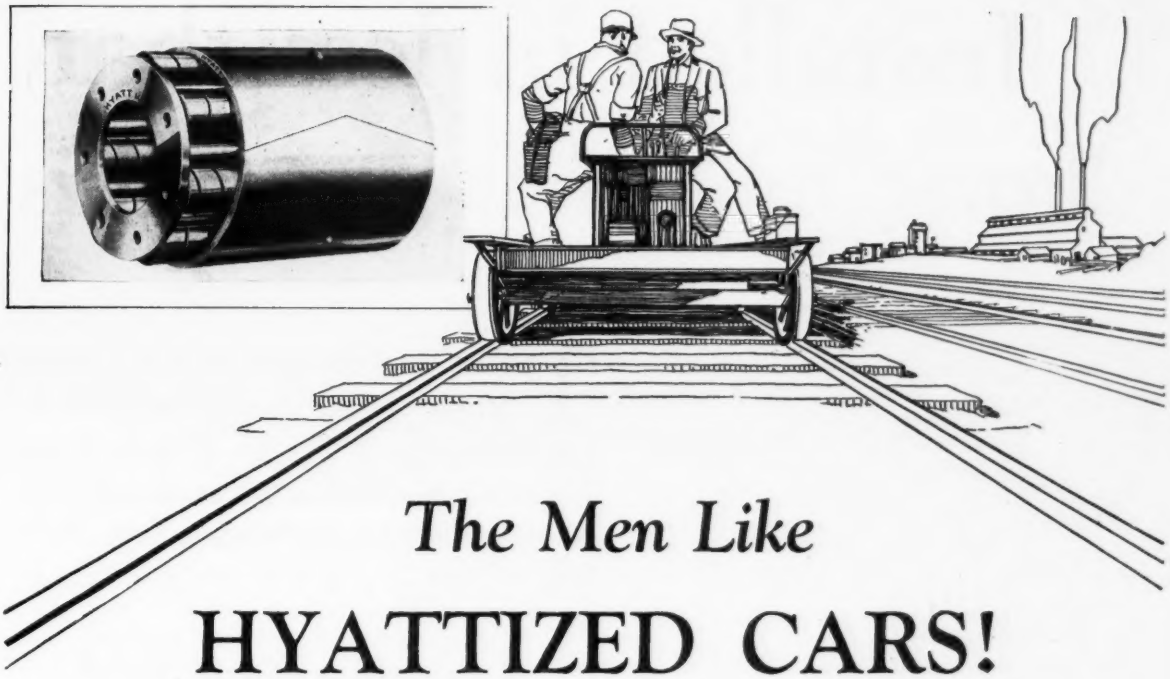
Concrete Products Corporation, Peoples Gas Building, Chicago

Sales Offices: New York, Atlanta, Cincinnati, St. Louis, Los Angeles

Canadian Concrete Products Co., Ltd. Transportation Building, Montreal, Que.

Massey Cribbing is produced in the same plants and is of the same high quality as Massey Culvert Pipe and other precast concrete products which have been standard construction on the leading railroads for years.

REM 2—Gray



The Men Like
HYATTIZED CARS!

They take the men to the job, and bring them back, quickly and dependably. No coaxing, or track-side tinkering. No loss of time, or patience.

One shot of grease every three or four months, and the Hyatts run for years without any other attention. They need no repairs or replacements.

Hyatt journal bearings are built to run smoothly and economically, *permanently*. They are practically wear-proof and frictionless, and cut gasoline costs 30 per cent.

Railways in every part of the world are saving time and money with Hyattized maintenance cars. Leading builders standardize on Hyatts and furnish replacement boxes to fit present equipment.

Specify Hyatt Roller Bearings on all your cars. After the rest of a car has worn out, you will probably find the bearings as strong and easy running as the day they were installed.

HYATT ROLLER BEARING COMPANY

Newark Detroit Chicago Pittsburgh
Worcester Philadelphia Charlotte
Oakland Cleveland

HYATT
ROLLER BEARINGS
PRODUCT OF GENERAL MOTORS

Installed in less than ....yet this

TAKE a good look at this photograph of the Union Pacific Railroad Crossing, at Orange Avenue, Long Beach, California. Note the smooth surface—the substantial construction. How long do you suppose it took to install it?

Less than one day!

Less than one day, yet in spite of the ease and speed with which this crossing was installed, it will last for years. That's because it's made of Carey Elastite Preformed Track Pavement, which actually knits and heals under traffic. This crossing will withstand the smashing impacts of heavy trucks without a whimper, too. In fact, it thrives on punishment—*improves* with hard knocks.

Carey Elastite

PREFORMED
TRACK PAVEMENT

"Knits and heals under traffic"

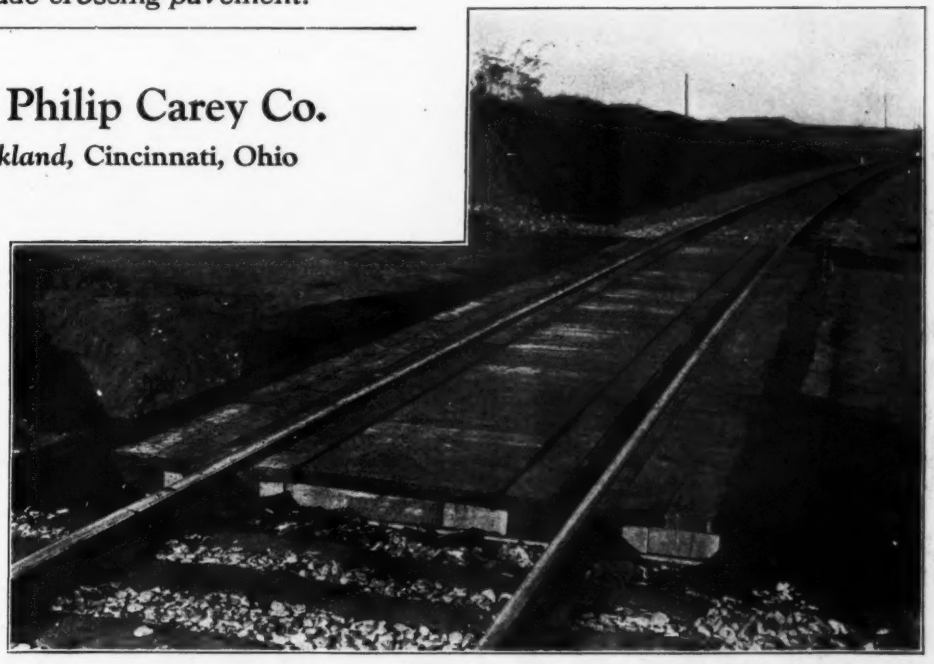
one day crossing *will last for years!*

Carey Elastite Preformed Track Pavement consists of slabs about 2 inches thick and sections of rail filler, both made of a fibrous, asphaltic material that knits and heals under traffic. The preformed slabs arrive cut to fit. Installed snugly in place with ordinary tools and ordinary labor, they form a watertight, traffic-proof crossing that will last indefinitely.

Write today, and have us supply you with complete information on this improved grade crossing pavement.

The Philip Carey Co.

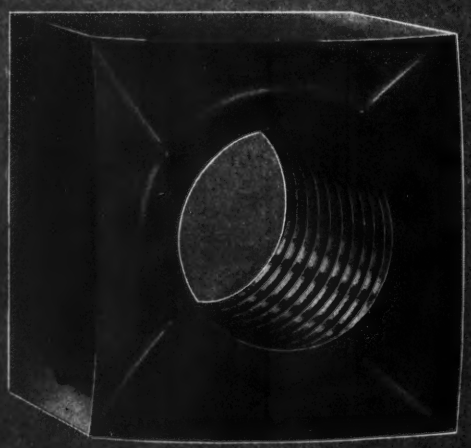
Lockland, Cincinnati, Ohio

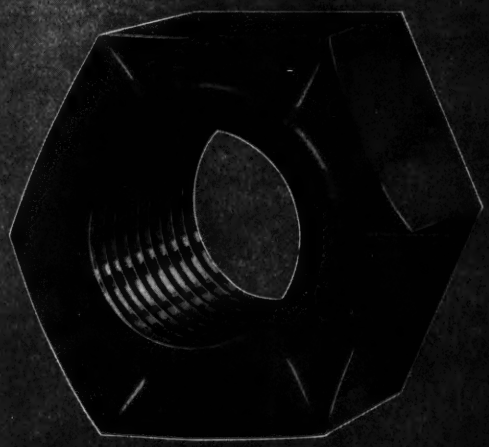


Union Pacific R. R. Crossing, Orange Avenue, Long Beach, California, 40 feet wide, with 90 lb. ARAA rails. Carey Elastite Preformed Track Pavement, installed on this crossing in less than one day, with ordinary carpenters' tools, will protect the crossing for years against traffic impact and bad weather.

VIBRATION SELFLOCK

"The Nut with the Star Crown"





"They lock on every thread"

SELFLOCK SCREW THREAD PRODUCTS

GRAHAM BOLT & NUT COMPANY,

will not loosen UNIT NUTS!

IT took 53 years of critical research before we placed the Selflock Unit Nut on the market. It is the first positive acting vibration-proof lock nut that locks in the multiple grip of every thread.

Each Selflock thread is a double locking unit forming a tight frictional lock on both sides of each bolt thread.

This gripping frictional contact is due to the unique design of the Selflock thread, which is cut at a scientifically determined angle making it impossible for a Selflock Unit Nut to jar loose.

The railroad industry will find in the Selflock Nut a means of saving thousands of dollars in maintenance by checking loose connections at the source. Once on, a Selflock Unit Nut remains permanently tight, regardless of vibration.

As a convincing test, apply Selflock Unit Nuts to your most troublesome application. Be sure you specify Selflock Unit Nuts by name—identified by the Star Crown trade-mark on every nut.

Pittsburgh, Penna.

TRIED AND FOUND TRUE

Power Plants are built in sizes to operate 4, 8 or 12 tamping units.

Aside from operating the Jackson Electric Tie Tampers, the Power Plants can be used for operating electric saws, drills, grinders and other electric track tools, and with compressors for painting equipment and sand blasting.

Also adaptable for use with flood light systems.

During the past seven years Jackson Electric Tie Tampers have proven to users on over 50 roads that tamping by means of electric power is now not only plausible, but worthy of continued operation and expansion.

Jackson Electric Tie Tampers are economical not only in having a low operating and maintenance cost, but in cutting down the necessity for large gangs for tamping and assuring work of greater permanence.

ELECTRIC TAMPER & EQUIPMENT CO.

RAILWAY EXCHANGE BUILDING CHICAGO, ILL.

Coffee *by Long Distance* $10,963.20 worth

A COLORADO COFFEE COMPANY devised a new container for its product. On one side appeared the name of the brand, on the other the word "sugar," "corn-meal," "salt" or some other commodity for which the can could later be used. Here was an idea likely to appeal to housewives. What was needed was quick distribution. They got it—by Long Distance. Telephone calls to 19 dealers in 9 states got 18 orders for 27,128 pounds of coffee. Later, the 19th dealer bought as a result of the call.

WHENEVER ACTION is important, we suggest long distance calls. Compare the charges with what it would cost to send representatives in person. Compare the number and size of the orders and compare the time required.

Hundreds of businesses are now using the telephone over states and over trade territories as they formerly used it locally. There are no county or state lines to the telephone, in buying and selling goods; in making appointments; in closing transactions. In saving time and money.

What concern would it pay to call now, in the next state or across the continent? The cost is usually less than you'd think. . . . . *Number, please?*

BELL LONG DISTANCE SERVICE

The WESTERN Institutional Idea

No. 1 of a Series

PIONEERING

CIVILIZATION pays homage to its pioneers, those sturdy souls who through daring and invention blaze new trails and smooth the path of progress.

For fifty years—from the crude days of the earth-moving and stone-handling industry's past—WESTERN WHEELED SCRAPER COMPANY has served as pioneer in creating and inspiring equipment known the world over and assisting in the great engineering projects of the times.

This spirit of progress—this institutional idea—guides Western today. Our new Catalog, issued in celebration of our fiftieth anniversary, is a summary of the foremost earth-moving equipment the inventive world affords. It surpasses all our previous issues and puts you abreast of the best thought in the industry. It presents the Western idea to the full. By all means get it. Those in the industry should write for it at once.

WRITE FOR THIS IMPORTANT GOLDEN ANNIVERSARY CATALOG TODAY

WESTERN WHEELED SCRAPER COMPANY

Aurora, Illinois

BRANCH OFFICES ALL OVER THE WORLD

1877 Western 1927

FACTOR IN THE PROGRESS OF THE WORLD

The Q & C Rolled
Steel Step Joint is Built to Last

For years the Q & C Rolled Steel Step Joint has been giving satisfactory service to the carriers throughout the country. The special design and material used in this joint assure a performance which becomes more necessary each day because of the heavier and fast moving equipment. Made of rolled steel, heat treated, this joint will outlast the life of your rail.

The Q & C Company **90 West St., New York**
Peoples Gas Bldg.—Chicago Rwy. Exchange Bldg.—St. Louis

To the RAILROAD MEN *of* AMERICA

AN OPPORTUNITY IS RIPE for saving about seven-eighths of the power now needed to start trains.

Hence heavier freights and smoothest passenger service are practical with present motive power.

A major economy can also be effected in car lubrication. Most of this cost is avoidable, with every requirement of maintenance and safety being met by journal inspection months apart! *Yet hot boxes will become unknown.*

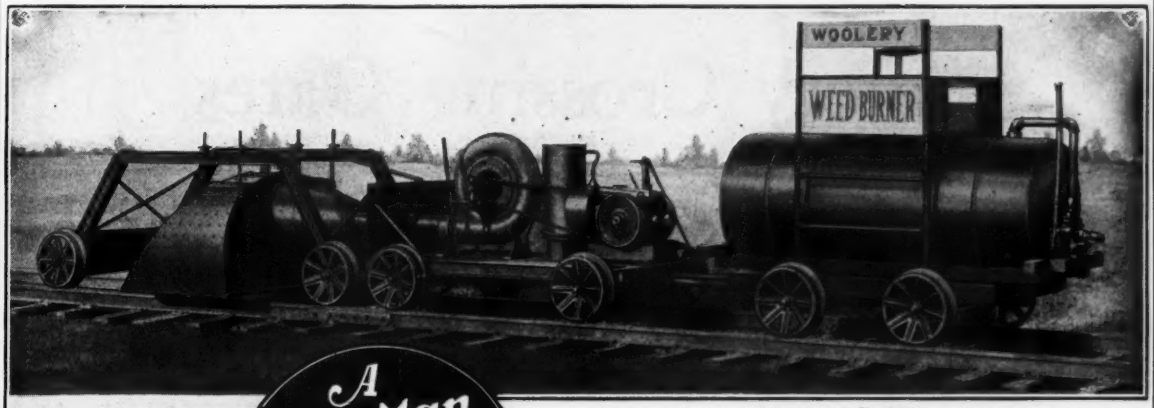
Indeed, all the chief causes of wear and tear disappear from trucks and draft gear, as the old sliding friction in journals is supplanted by perfectly lubricated rolling motion, confined entirely to hardened, ground, special alloy steel, of utmost durability.

An established, conservative, highly successful, world-respected engineering institution sponsors all this. It is being accomplished today by means of Timken Tapered Roller Bearings. They have become universal throughout transportation and other industries.

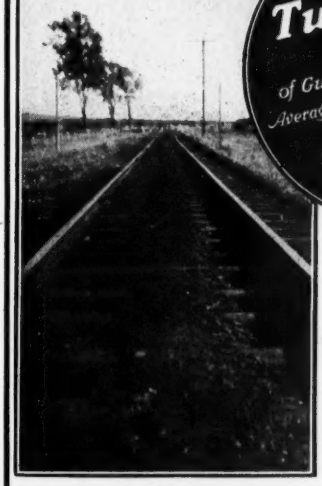
Data on Timken Bearings in car journals, and any desired engineering counsel, are at the disposal of every railroad. THE TIMKEN ROLLER BEARING CO., CANTON, OHIO

H. H. Timken

MONEY IN ASHES



Patent Applied For



A Two-Man Outfit of Guaranteed Efficiency
Average cost on first heavy burning less than
$3.00 per mile

That's what you have when you convert the Weeds on your tracks into ashes with WOOLERY RAILWAY WEED BURNERS.

Three years of extremely successful operation have demonstrated their ability to clean tracks at a low cost in record time, with a small crew of men.

Vegetation is completely consumed with no damage to sound ties. No film of oil is left on the rails.

Kerosene, Gas Oil or the lower grades of Distillate can be used for fuel.

Only ONE large atomizing Burner — never clogs — never whips out by weeds.

The Weed Burner can travel **any** speed from 1 to 6 miles per hour for burning and up to 20 miles per hour for traveling.

Use this outfit to clean the tracks on your branch lines, yards and Y's and learn there is Money in Ashes.

Before Burning

After Burning

A Weed Burning Report That Carries Conviction

Lubricating Oil and Other Supplies	$ 2.80
Gasoline—180 gallons	22.50
Distillate—2866.14 gallons	114.64
Freight on distillate	132.42
Repairs (Includes both labor and material)	53.26
Rental of Equipment (15 days)	45.00
Wages and Expenses of Operator	86.56
Wages of Section Men following Burner	75.60
Total	$532.78
Miles burned	204
Average cost per mile	$ 2.61

Railway Motor Cars—Gasoline Engines—Rail Layer Attachments—Tie Scoring Machines

Woolery Machine Co. *Write for Prices and Further Information* **Minneapolis, Minn.**

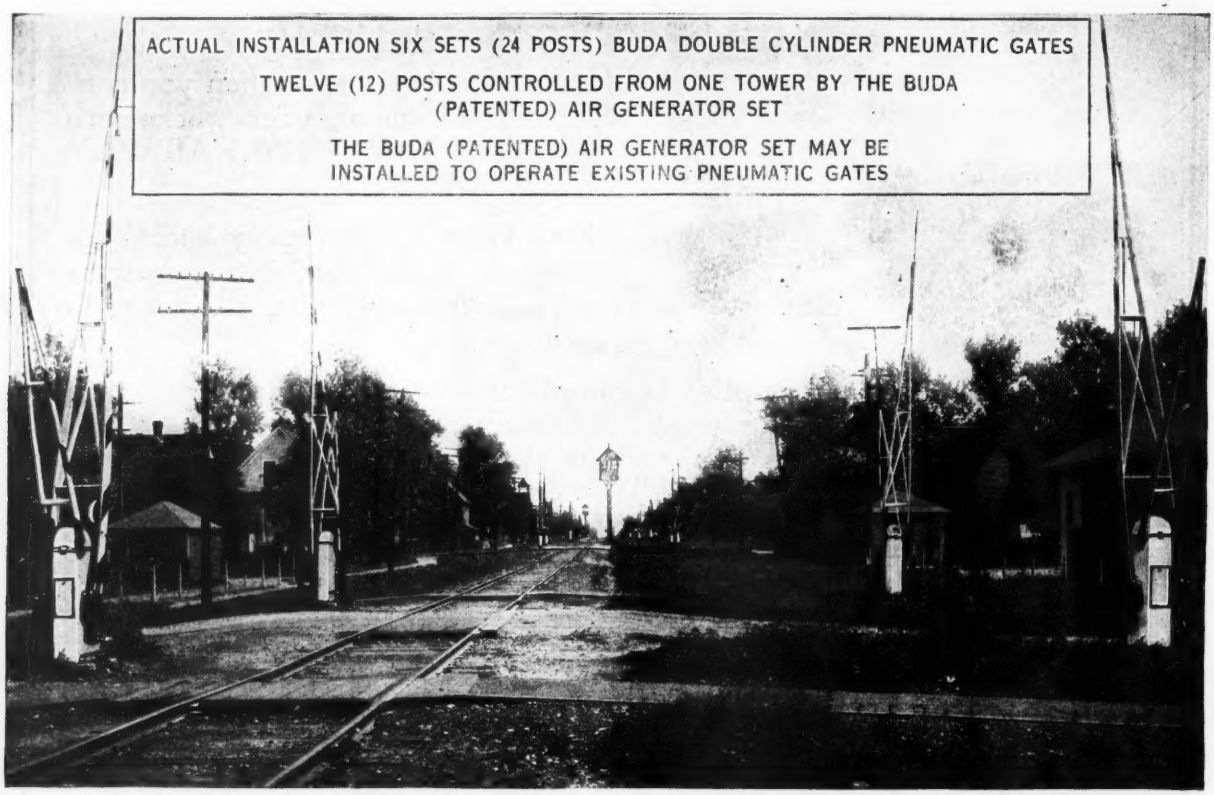
BUDA
ESTABLECIDA
1881

Safety Crossing Gates

Electric, Pneumatic, Mechanical Lever and Crank Types

A Protective Safeguard

at street and railway crossings, drawbridge approaches


ACTUAL INSTALLATION SIX SETS (24 POSTS) BUDA DOUBLE CYLINDER PNEUMATIC GATES
TWELVE (12) POSTS CONTROLLED FROM ONE TOWER BY THE BUDA (PATENTED) AIR GENERATOR SET
THE BUDA (PATENTED) AIR GENERATOR SET MAY BE INSTALLED TO OPERATE EXISTING PNEUMATIC GATES

SIMPLE IN CONSTRUCTION
FEW MOVING PARTS

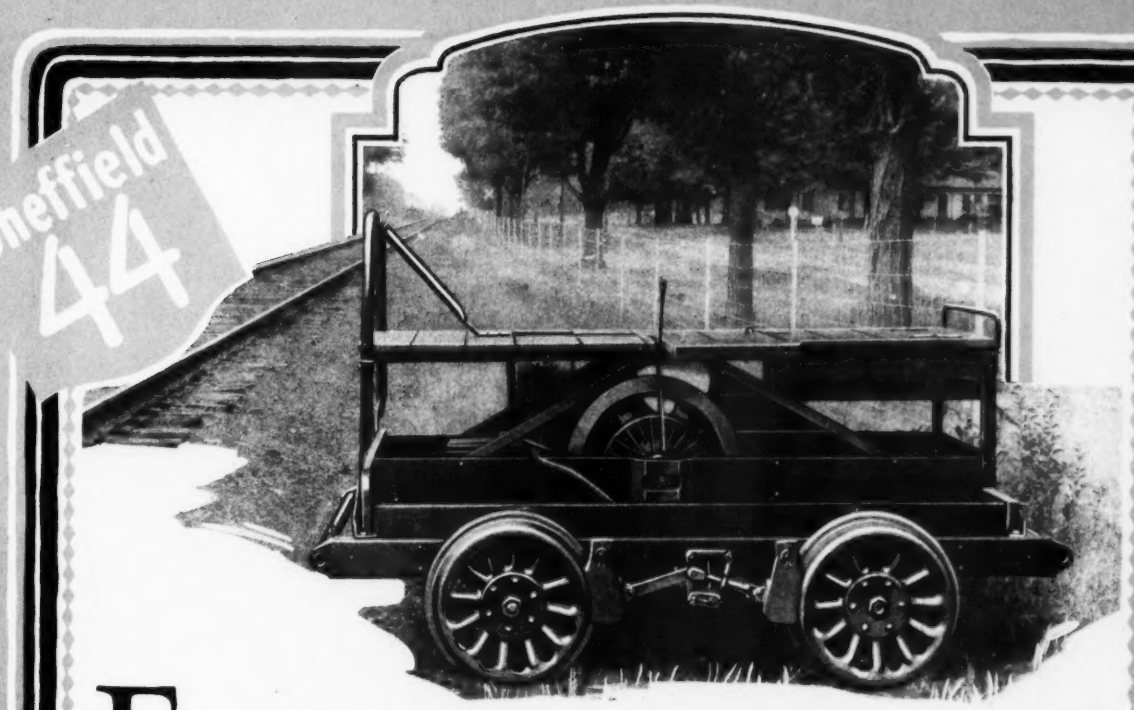
ACCESSIBLE TO ADJUSTMENT
LOW MAINTENANCE COST

Send for Catalogue

THE BUDA COMPANY

HARVEY { CHICAGO SUBURB } ILLINOIS

Railway Exchange	30 Church Street	Railway Exchange		664 Mission St.	75 Evershot Road
CHICAGO	NEW YORK	ST. LOUIS	ATLANTA, GA.	SAN FRANCISCO	LONDON N-4



Engineering leadership

BRAINS have taken the brute force out of section motor car operation. The advanced drive of the Sheffield "44" is a case in point. Instead of the old belt drive with tug-of-war between the operator and a tension lever, the "44" offers you chain drive with positive clutch control. A clutch that is easy to operate, fool-proof and practically indestructible. It can't be burned out!

No more broken belts and costly delays. No sliding engine bases and attendant troubles. Here is perfected design! A clutch that is an engineering masterpiece—velvety in action but positive when fully engaged.

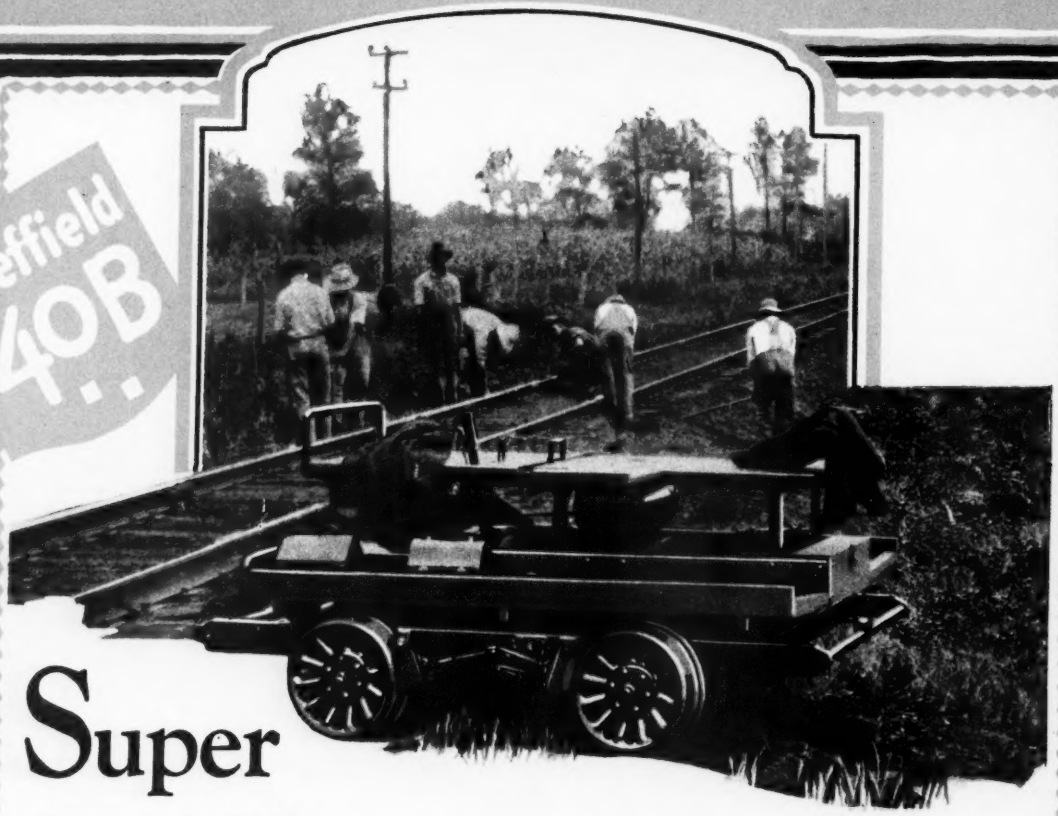
Various speeds are obtained and loads easily started by slipping the clutch. Slip it as much as you want—without danger. The cooling fins, which dissipate the heat, and other finely worked out details of design make it equal to the roughest treatment.

In addition to this perfected clutch, the "44" has many other features that have made it the leader in the one-cylinder water-cooled section motor car class. Write today for descriptive bulletin giving complete details.

The Sheffield "44" is only one of a complete line of F-M section motor cars equally advanced in design and dependable in operation—a section motor car for every duty

FAIRBANKS-MORSE
MOTOR CARS

First on the rails — and still first



Super

dependability, economy and performance

The Sheffield "40-B"—foremost in everything a fine motor car should be—gives you this, and *more*. Abundant power for hauling a big gang of men with their tools—and trailer, too. Exceptional torque at low speeds. Three-point suspension of engine. Simplified friction transmission. Timken tapered roller bearings on drop-forged crankshaft and also on axles. Strong pressed steel automobile-type frame. Positive force-feed lubrication. These and many other features of highly perfected design make this a motor car without peer.

FAIRBANKS, MORSE & CO., *Chicago*

Manufacturers of railway motor cars; hand cars; push cars; velocipedes; standpipes for water and oil; tank fixtures; oil engines; steam, power and centrifugal pumps; scales; complete coaling stations

FAIRBANKS-MORSE
MOTOR CARS

First on the rails — and still first

ARA21.14

TONCAN For Permanence

TONCAN COPPER Mo-lyb-den-um IRON

at a reasonable cost

Toncan Iron perforated drains have been used for railroad sub-drainage for 17 years.

THE mechanical advantages of the corrugated type of culvert are thoroughly established.

Safety in shipment; ease of handling; a saving of 75% in installation costs; and strength to meet the most severe requirements have been proven by thousands of installations.

Corrosion is the corrugated culvert's worst enemy and now that too is checked by making the culverts of Toncan Iron.

To iron that has been thoroughly refined is added copper and molybdenum. These two elements alloy with the iron and impart a corrosion resistance that has never been reached before.

Thus Toncan Iron is particularly fitted for the permanence which is so necessary in culverts. Yet Toncan costs no more.

Following are the makers of Toncan Culverts. Write the nearest one:

The Berger Manufacturing Co.
Roanoke, Virginia
Tri-State Culvert Manufacturing Co.
Memphis, Tenn.
The Canton Culvert & Silo Co.
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CENTRAL ALLOY STEEL CORPORATION, *Massillon*, OHIO
Makers of Agathon Alloy Steels

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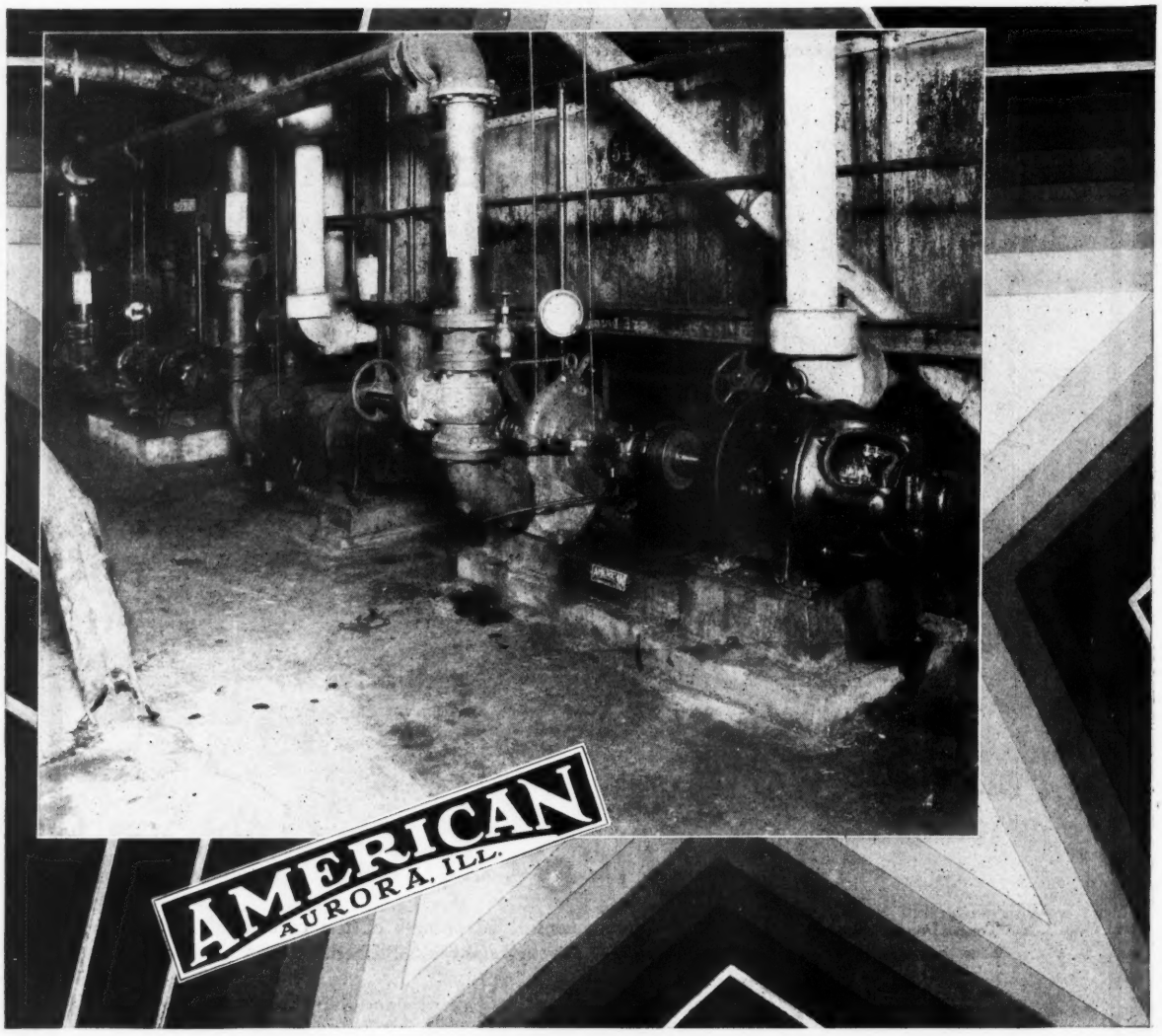
TONCAN IRON



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National Refining Company Uses "American" Pumps

PICTURED above is an installation of American Well Works pumps in one of the plants of the National Refining Company.

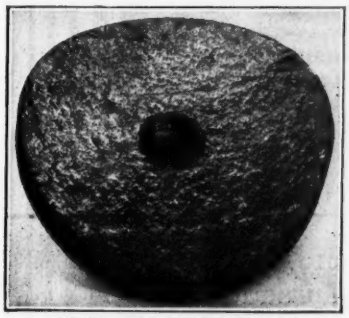
Many of the largest industries of this country use pumps bearing the name-plate of the American Well Works throughout their plants. The efficient handling of liquids in the complicated industrial processes of today demands pumps that are unusually simple in construction, steadfast and powerful in operation. As they are built to the specifications of engineers to meet particular requirements of industrial usage, it is but natural to expect unusual quality and performance from American Well Works pumps.

To aid you in specifying and selecting pumping equipment, the advice of a group of "American" engineers who are thoroughly conversant with industrial practices is at your disposal.

THE AMERICAN WELL WORKS

General Offices AURORA, ILLINOIS *and Factory*

The Error Of Making The Exception The Rule



OUTSIDE OF CAST IRON PIPE
USED 31 YEARS

Specimen cut from 36-in. main laid in October, 1893, in 75th St. at Yates Ave., showing the shiny surface of coating intact

Flow Tests of Old Cast-Iron Water Mains, Chicago Water-Works

Pipe in Use 9 to 36 Years Show Low Friction Loss and That Coefficient Should Be Based on Corrosivity of Water

By J. B. Eddy
Engineer, Water Pipe Extension Division, Chicago Water Department

INSIDE OF CAST IRON PIPE
USED 35 YEARS

Cut from 12-in. main laid in April, 1889, in Roosevelt Road at Troy Street. No deep tuberculations were found

IN THE design of cast-iron feeder mains the most important factor to be considered is the friction coefficient, C. If too high a coefficient is used in computations there will be an excessive loss of head when the main is worked to capacity, resulting either in low pressure to the consumer or waste of power at the pumping station in order to carry a high pressure to compensate for the friction loss. If too small a coefficient is used money may be wasted in laying a larger main than is actually needed. The tendency in the past has been to err in using coefficients too low, as many standard tables in common use have been constructed that provide for a definite increase in loss of head with the age of the pipe. While this error has been on the side of safety, as far as carrying capacity is concerned, it may cause a needless expenditure of money. (See Art. 116, Merriman's "Treatise on Hydraulics.")

Experience has shown that whether or not there is an increase in friction head with age depends entirely upon the quality of the water conveyed. In some localities where extremely soft waters are found tuberculation will occur and unless steps are taken to clean the pipe lines with some degree of regularity high friction heads will ultimately result. In other places tuberculation is entirely absent and after years of service the interior of the pipe is approximately in the same condition as when first laid.

Cast-iron mains in the Chicago water system are typical of the latter class. Examinations and test indicate that age has little or no effect on their carrying capacity.

The tabulation that follows shows the results of some of the tests made over a period from 1907 to date.

As a result of these tests and examinations made by the Chicago Water Department, it is customary in figuring pipe sizes for feeder mains to assume that the pipe coefficient will not change with age.

TYPICAL FRICTION LOSSES IN CAST-IRON MAINS, CHICAGO WATER-WORKS

Tests Made from 1907 to 1925 by Water-pipe Extension Division, Chicago Water Department

Location	Diameter, Inches	Years of Service	Length, Feet	Results Shown by the Tests: Velocity Ft. Per Sec.	Loss of Head, Ft.	Coef. in Chezy Formula	Coef. in Hazen & Williams Formula
66th St. and Stony Island Ave. to 51st St. and Harper Ave.	36	9	10,900*	5 33	18 3	150	152 6
67th St. and Stony Island Ave. to Cottage Grove Ave.	48	10	5,300	5.4	6 1	159	158 3
Oglesby Ave. and 68th St. to Stony Island Ave. and 67th St.	48	10	5,300†	7 0	11 8	149	143 0
66th St. and Cottage Grove Ave. to 66th St. and State Street	36	24	6,415‡	4 12	8 24	133	136 7
67th St. and Cottage Grove Ave. to 67th St. and State Street	30	30+	4,950	5 3	12 53	133	136 2
Oak St., Clark St. to Cambridge St.	24	25+	2,830	2.61	2 81	117	138 1
51st St., Wabash Ave. to Halsted St.	20	15	5,470	3 21	8 68	125	137 5
67th St. and Cottage Grove Ave. to 67th St. and State Street	16	30+	5,250	3.89	14.3	130	143 4

*Two right-angle bends in line. †One right-angle bend in line. ‡ Four right-angle bends in line.

Address: Research Engineer
The Cast Iron Pipe Publicity Bureau, Peoples Gas Building, Chicago

CAST IRON PIPE

THE BELL & SPIGOT JOINT

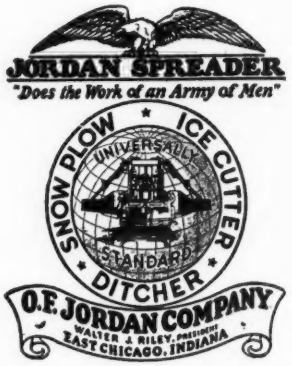
THE ACCEPTED STANDARD FOR UNDERGROUND CONSTRUCTION

Our new booklet, "Planning a Waterworks System," which covers the problem of water for the small town, will be sent on request

Send for booklet, "Cast Iron Pipe for Industrial Service," showing interesting installations to meet special problems

JORDAN SPREADER

The Composite Spreader-Ditcher, which is the Jordan Spreader with the composite Spreader-Ditcher Attachment, performs all the functions of the Spreader (moves earth, spreads bulky materials, plows snow) and in addition will shape ballast and subgrade, form new ditches or clean old ones, and trim the banks of cuts to a uniform slope.



An all-year Machine. In use on North America's leading railroads.

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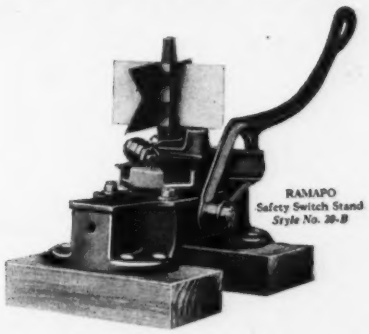
SAFE *under all conditions*

WITH a positive throw for hand operation, and with an automatic throw in case the engineer runs through a set wrong switch, Ramapo Automatic Safety Switch stands insure safety under all conditions. Neither carelessness in operation nor error in setting can lead to a derailment or a wreck. We'll be glad to demonstrate in your own yards, proving at first hand, why roads throughout the country are specifying—

RAMAPO AUTOMATIC SAFETY SWITCH STANDS



A coil spring has been introduced in the 20-B Stand to maintain the stability of the horizontal lever. This improves the action so that when the horizontal lever goes into its latched position, it does so with a snap. The operator is thereby emphatically notified that the stand is fully thrown and latched.

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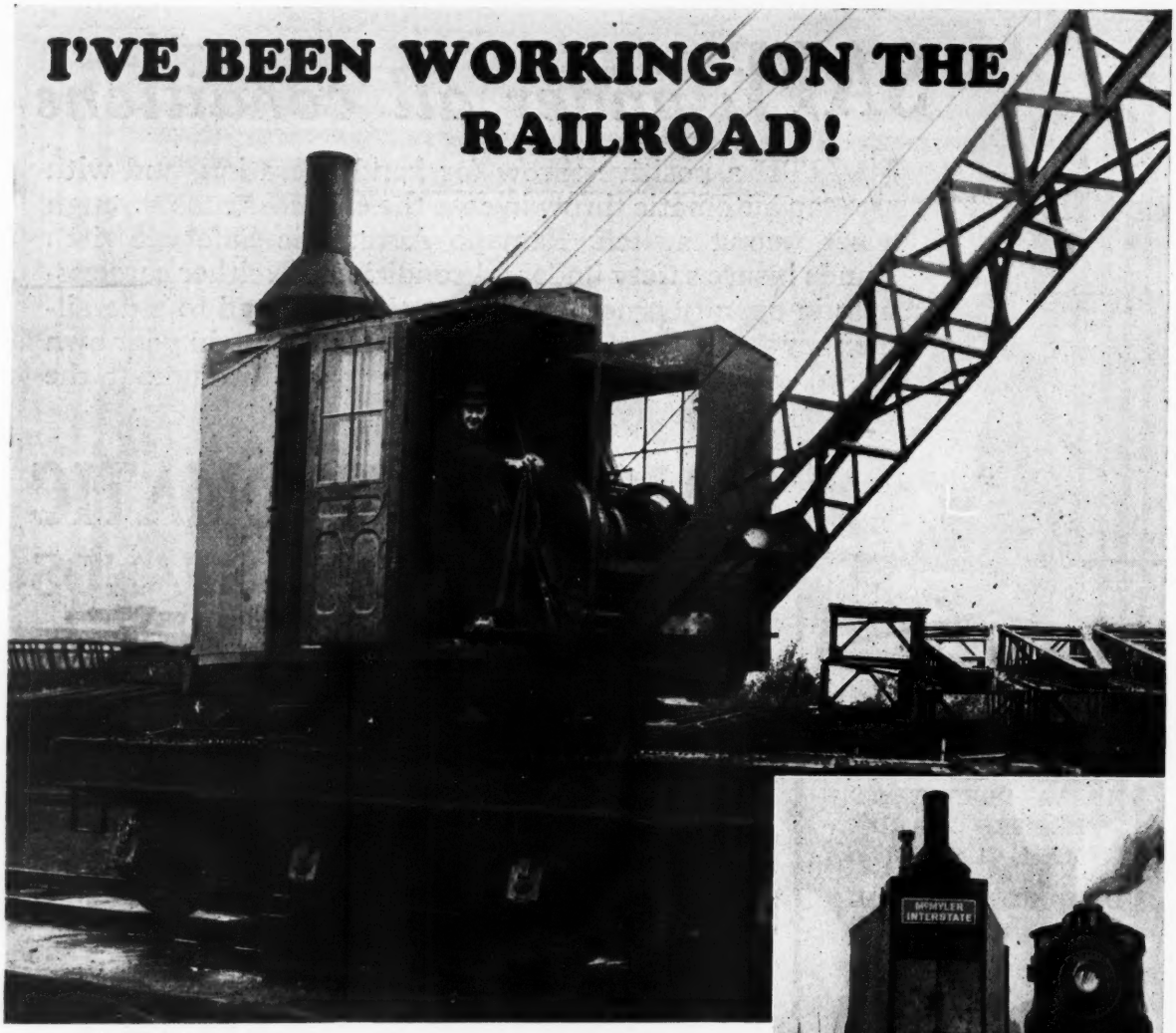
SPECIAL RAILWAY TRACK WORK

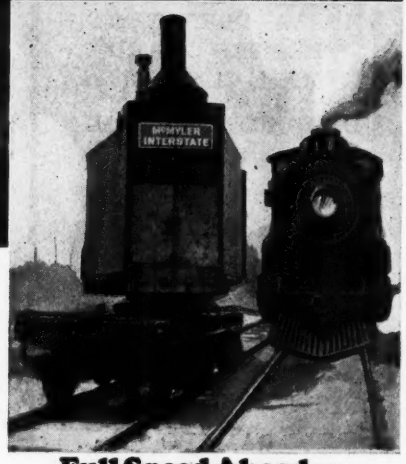
I'VE BEEN WORKING ON THE RAILROAD!



BREAKING SPEED RECORDS

Screening ballast at the rate of 1,000 ft. of double track per day is just an average day's work for the No. 2 Bob-Tail. The natural speed of the crane is augmented by its ability to work uninterrupted by traffic on adjacent tracks.

The Bob-Tail is correspondingly efficient on any of the other numerous digging, rehandling, or lifting operations assigned to locomotive cranes.



Full Speed Ahead— when the No. 2 Bob-Tail is working on adjacent tracks. The fool-proof positive swing-stop makes collisions impossible.

Steam Shovels • Gas Shovels • Locomotive Cranes • Clam-shell Buckets

C-2-140

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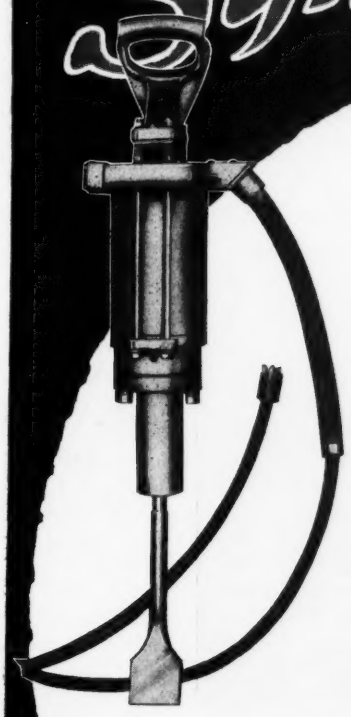
What is the Syntron ELECTRIC TIE TAMPER ?



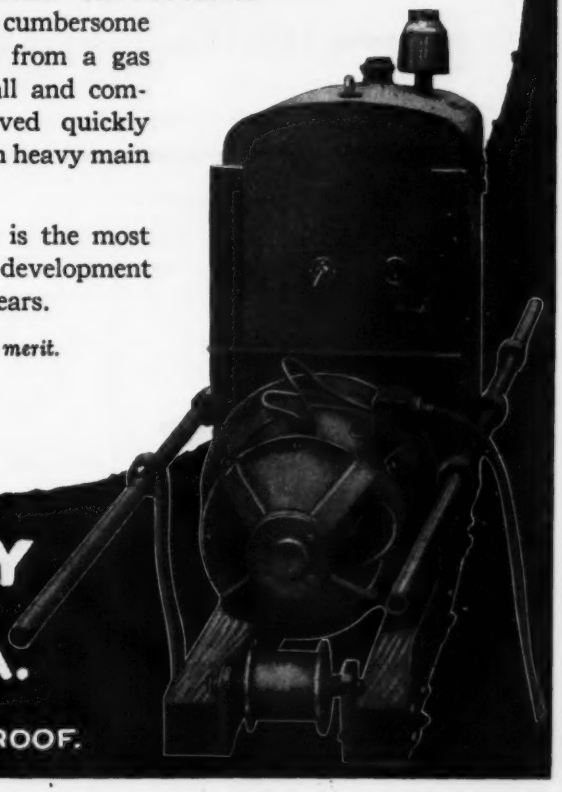
THROUGH a unique application of magnets, energized by alternating current, the Syntron Tie Tamper strikes 1500 blows a minute, making one section laborer equal to three with pick tampers.

Its rapid, powerful blows, force the ballast squarely under the tie until every crevice is packed tight assuring a safer, more permanent track than is possible by hand.

A distinctive feature of the SYNTRON is its unique simplicity. Having only one moving part, the Syntron has no eccentrics or gears to get out of order. No motor to burn out. Can't be stalled or overloaded: Requires no cumbersome compressor, but operates from a gas electric power unit so small and compact that it can be moved quickly enough to permit its use in heavy main line traffic.

The Syntron Tie Tamper is the most outstanding, progressive development in track maintenance in years.

Let us demonstrate its merit.



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PRACTICAL - ECONOMICAL - FOOLPROOF.

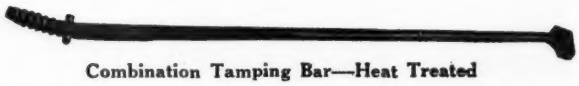
Saving 60% of Labor and Tool Cost on over 100 Railroads

3 MEN CAN DO THE WORK OF 7 TO 9 MEN

7 MEN CAN DO THE WORK OF 15 to 20 MEN

Showing 3 Men Lining Track with 3 Hackmann Combination Track Liners — Saving Labor Cost of 4 to 5 Men

Combination Lining Bar



Combination Tamping Bar—Heat Treated

Hackmann Combination Track Liner Used with Special Bar. Has the Two Step Feature. Bar Can Be Removed and Base Left in Track.

MORE SATISFACTORY RESULTS CAN BE OBTAINED WITH HACKMANN TRACK LINERS THAN ANY OTHER LINER ON THE MARKET

WILL BE ON EXHIBITION AT THE RAILWAY APPLIANCE CONVENTION

Hackmann Duplex Track Liner to Be Used with Ordinary Lining Bars. Has the Two Step Feature. Fulcrum Can Be Removed and Base Left in Track.

THE HACKMANN RAILWAY SUPPLY CO.

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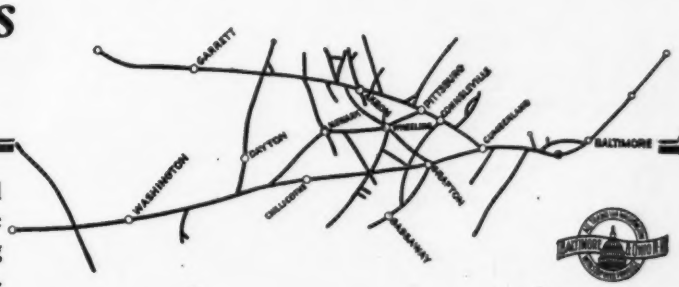
B. & O. Division Points

ARE EQUIPPED WITH

Matthews Mechanical Painting Equipments



The illustration above shows the division points on the B. & O. equipped with Fig. 105 Matthews Mechanical Painting Equipments

Two No. 105 Matthews Mechanical Painting Equipments used for twelve months on Maintenance-of-Way painting on the Baltimore division of the B. & O. Railroad revealed a saving of approximately 40%. Based on this performance 13 additional Matthews Mechanical Painting Equipments were bought and placed at various other division points. The showing to date has been most satisfactory.

Isn't such evidence conclusive proof of the superiority of Matthews Mechanical Painting Equipments? They are built to stand the wear and tear of heavy duty, giving dependable service day after day. Each part of a Matthews Equipment has been made standard only after thoroughly demonstrating its ability to function perfectly in relation to the other elements in the unit. From the guns down to the engine that drives the compressor, Matthews Equipments have proven time and again that they can be depended upon to furnish a constant air pressure up to 90 pounds, absolutely free from oil or moisture in the air lines, on every type of the most difficult maintenance work.

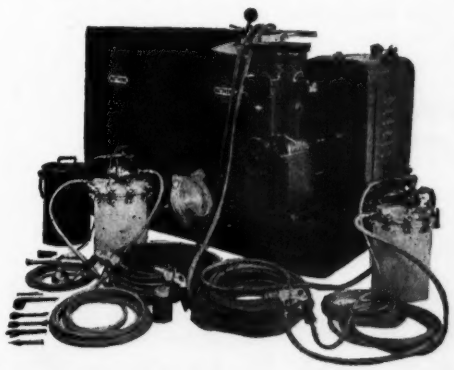


Fig. 105 *Complete two unit with heavy duty equipment. Air capacity sufficient to operate three units or one rotary wire brush.*

The Matthews Gun

Of particular importance is the Matthews Gun which has the exclusive "air envelope" feature for reducing fog and mist to a minimum. It permits the use of practically any material that can be applied with a brush. Often it reduces the number of coats required. Perfectly balanced, light in weight and having a comfortable Bakelite pistol grip, it is overwhelmingly preferred by workmen everywhere. Easily cleaned, quickly adjustable from a spot the size of a dime to a 12 inch fan stroke.

Get This Interesting Booklet

"Mechanical Painting for Maintenance" is a 12-page booklet that will answer many of the questions you want to ask about your painting problems. Tells about mechanical painting in general. Gives comparative costs on brick, corrugated iron, stucco, weatherboard, shingle roofs, tanks and all kinds of interior surfaces. Gives full information regarding the different kinds of materials handled and how to select them. Shows photographs of different equipments and close-ups of various units in their make-up. Gives extracts from 14 letters received from prominent manufacturers regarding their experience. Has a page of questions and answers. Tells about the instruction given your men and the service you can expect. Send for this booklet today.

W. N. MATTHEWS CORPORATION
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MATTHEWS
MECHANICAL PAINTING
EQUIPMENT

ONE PRINCIPLE FOR TWENTY YEARS

30 cu. yd. Extension Side Dump Cars in general maintenance work on the Pittsburgh and West Virginia Railway.

A SOUND INVESTMENT

EXTENSION Side Dump Cars meet present day needs for dependable and low cost dumping equipment. The balanced principle gives a high percentage of live load. The cost per cubic yard of capacity is low and the handling and maintenance expense per cubic yard of material moved is lower. For dumping, little air is required because it is easier to dump a balanced load.

All dumping is done speedily and with perfect safety because the down turned door is completely out of the way in full dumped position. Extension Side Dump Cars will be furnished in any cubical capacity from 20 to 50 yards, level full or 28 to 70 yards normal loading.

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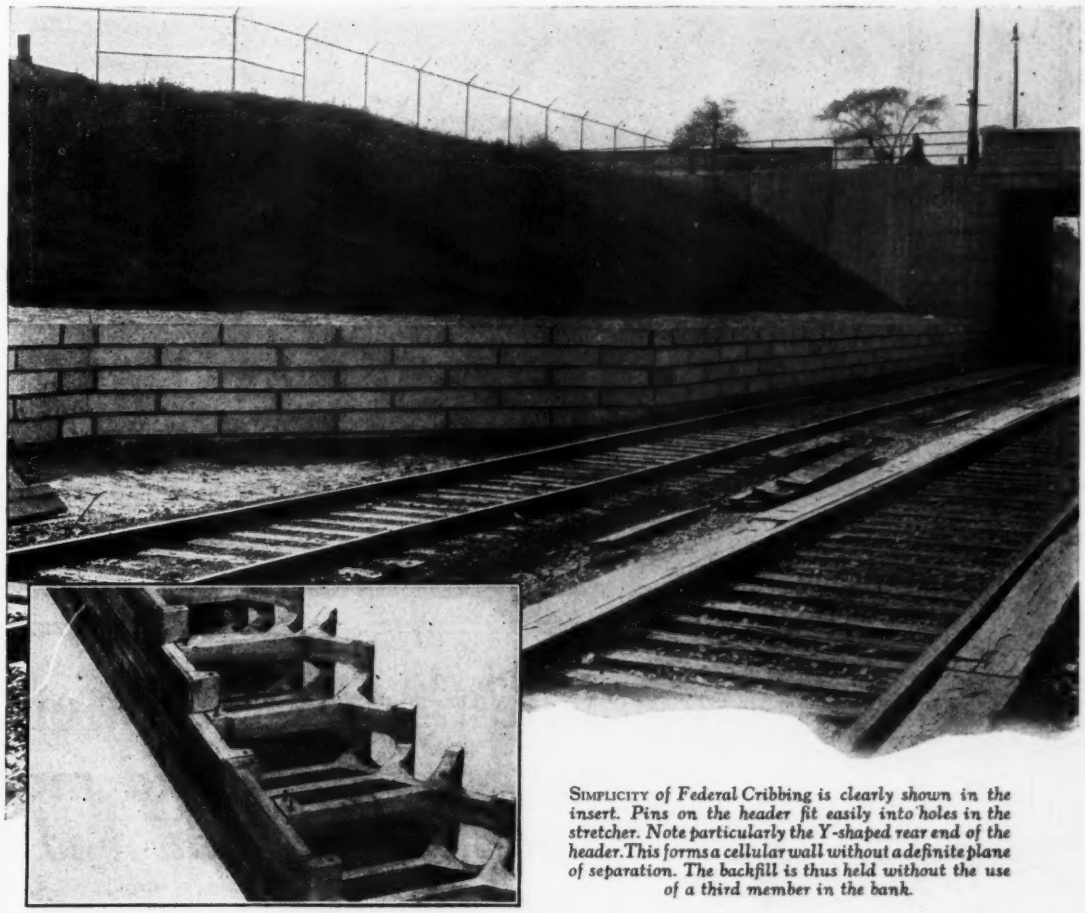

SIMPLICITY of Federal Cribbing is clearly shown in the insert. Pins on the header fit easily into holes in the stretcher. Note particularly the Y-shaped rear end of the header. This forms a cellular wall without a definite plane of separation. The backfill is thus held without the use of a third member in the bank.

Two Members Instead of Three

A wall of strength and durability, having the fine appearance of good masonry, plus flexibility and amazing simplicity of construction. This you are sure of when you use Federal Concrete Cribbing—the cribbing with only two members instead of three.

For further information write to

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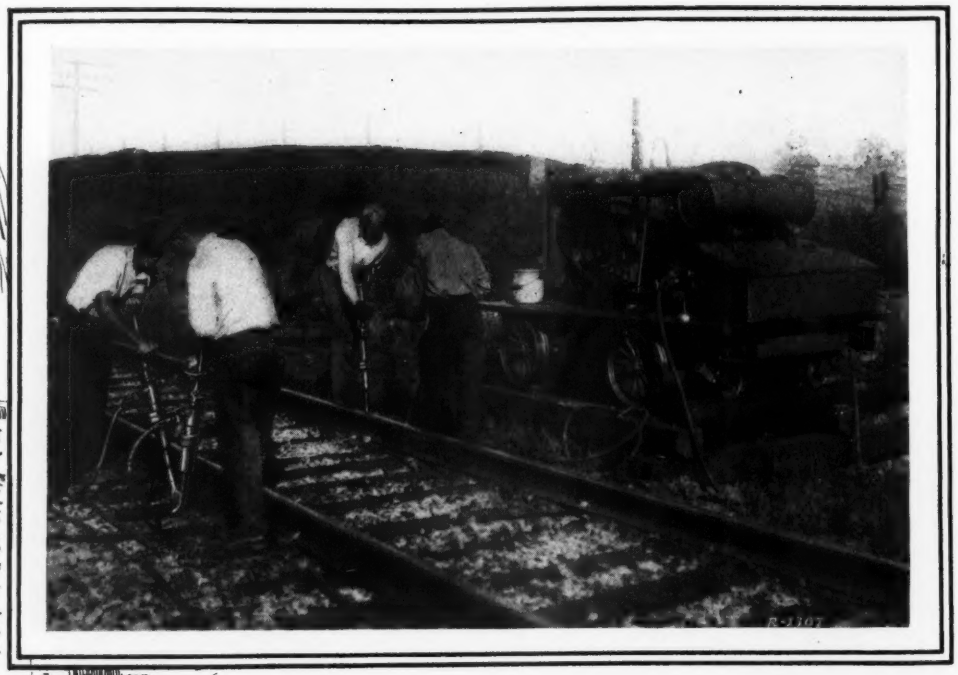

Pneumatic Tampers

make a firmer and more permanent road bed

More track can be tamped per day, and a more uniform roadbed obtained, when pneumatic tie tampers are used. Full tamping power is available all day long.

Four men with pneumatic tampers will tamp more track per day, and do a better job, than ten to twelve men using hand methods.

An Ingersoll-Rand Portable Air Power Unit for tie tamping, rail bonding, rail bolting, bridge repair, concrete breaking, drilling, etc., effects a surprising reduction in the time and cost of the work. An investigation of these air power units will show many ways to reduce track costs. Ask for complete information.

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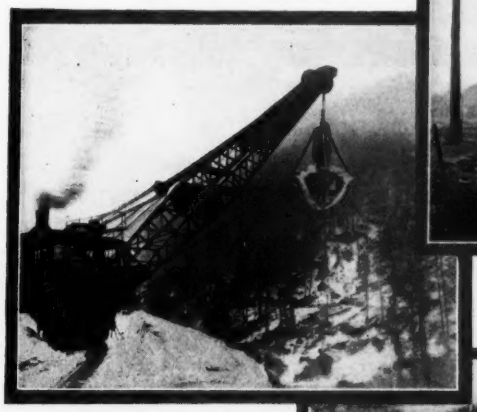
Ingersoll-Rand

At Right

Hayward Electric Motor Bucket operated by overhead crane cleaning ash pits and loading ashes into cars.

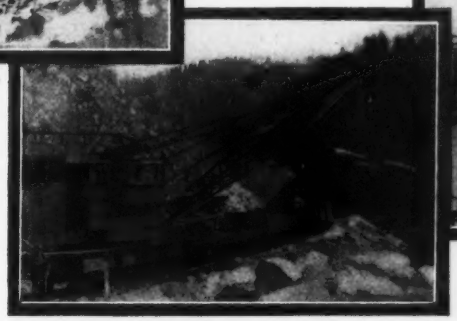
Below

Hayward Orange Peel Buckets cleaning snow from a railroad's right-of-way.



Below

Hayward Orange Peel Bucket handling logs.



Above

A standard railroad ditcher operating a Hayward Bucket.

Electric Motor Buckets

Clam Shell Buckets

Orange Peel Buckets

Drag Scraper Buckets

Counterweight Drums

Automatic Take-Up Reels

Skid Excavators and Dredges

All but the overalls

Hayward Buckets are experienced railroad workers—all but the overalls. Put them to work on your road, and see a new low water mark in material handling expense.

Give them tough jobs to do. Let them clean ash pits, dig ditches, coal locomotives, reclaim stored materials, keep the right-of-way clear of snow. Let them show you how one man can do the work of a gang.

The wide Hayward line provides a bucket to fit the job. Get in touch with Hayward engineers, and talk over your own special material handling needs.

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46 Dey Street New York, N. Y.

Builders of Clam Shell, Drag Line, Orange Peel and Electric Motor Buckets; Dredging, Excavating, and Coal Handling Machinery, Automatic Take-Up Reels; Counterweight Drums.

HAYCO

Hayward Buckets

Casey Jones

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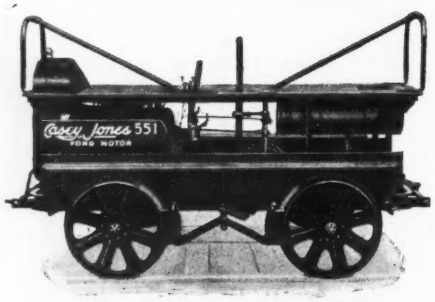
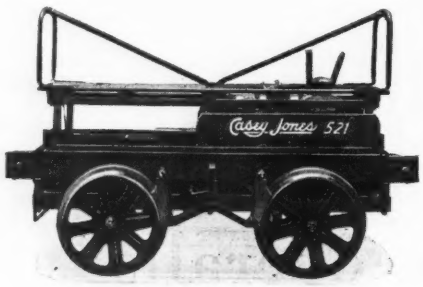
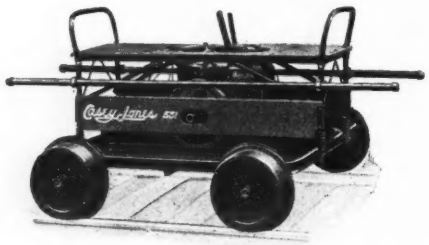


HEAVY DUTY SERVICE



STANDARD SECTION



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EVERY CLASS OF CAR WILL BE EXHIBITED

WE ARE PREPARED TO PROVE TO YOU THAT A VERY GREAT SAVINGS IN INITIAL INVESTMENT AND COST OF OPERATION CAN BE ENACTED BY ADOPTING THE IMPROVED PRACTICES OF RAILWAYS WHO HAVE PROVED THAT EVERY TYPE of Casey Jones MOTOR CAR IS CAPABLE OF PRODUCING BETTER SERVICE ON THE JOB.

THE RIGHT CAR FOR EVERY CLASS OF SERVICE			
Class A	For Heavy Duty	Casey Jones 551	4 to 150 Men—Trailers
Class B	For Standard Section	Casey Jones 521	2 to 30 Men—Trailers
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Koppel, Pa., Exclusive Export Agents

For Reliable and Economical Service

THE use of unsound timber results in decreased tie life and unreliable operation. With wheel loads heavier, traffic more dense, safety and maintenance standards more exacting, the service demanded from ties is steadily becoming more severe. Only high quality ties can survive.

It is highly uneconomical to spend $2.75 to put a defective tie in track which, even though treated, gives only 6 or 7 years' life; when sound decay-free timber properly treated gives 18 to 20 years' life or more.

Greatest economy results from maximum length of service. This can be secured only from high grade timber, thoroughly treated.

International ties are produced, inspected, graded and treated in strict accordance with A. R. E. A. Specifications. That means high quality and long life.

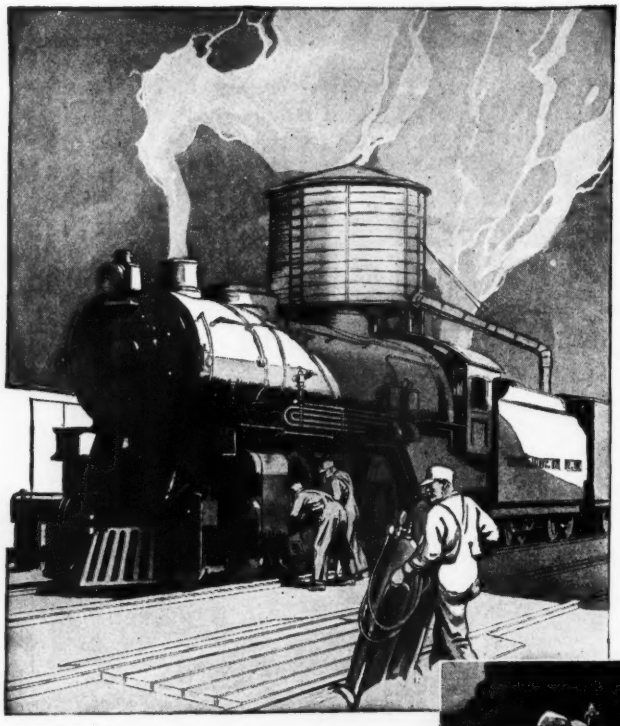
Contract now for International ties

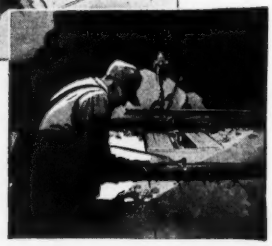
International Creosoting & Construction Co.

General Offices—Galveston, Texas

International

STANDARD SPECIFICATION TIES





WHY we use Linde Oxygen

Linde oxygen, used by Oxweld Railroad Service, has been industry's standard for years. Thirty-seven plants, located at important railroad junction points, guarantee its availability at all times and in unlimited quantities.

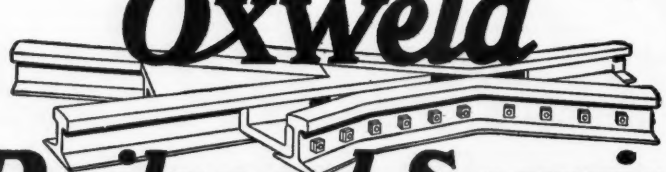
The intelligent and practical use of such a high-quality product is the job of Oxweld Railroad Service. Its men are experts in welding and cutting by the oxy-acetylene process. For 14 years they have perfected the applications of welding and cutting to railroad work. They have developed technique especially adapted to the problems of the individual road. They are pioneers as well as experts.

THE OXWELD RAILROAD SERVICE COMPANY

Unit of Union Carbide and Carbon Corporation

New York City: Carbide and Carbon Building *Chicago:* Railway Exchange

Oxweld



Railroad Service

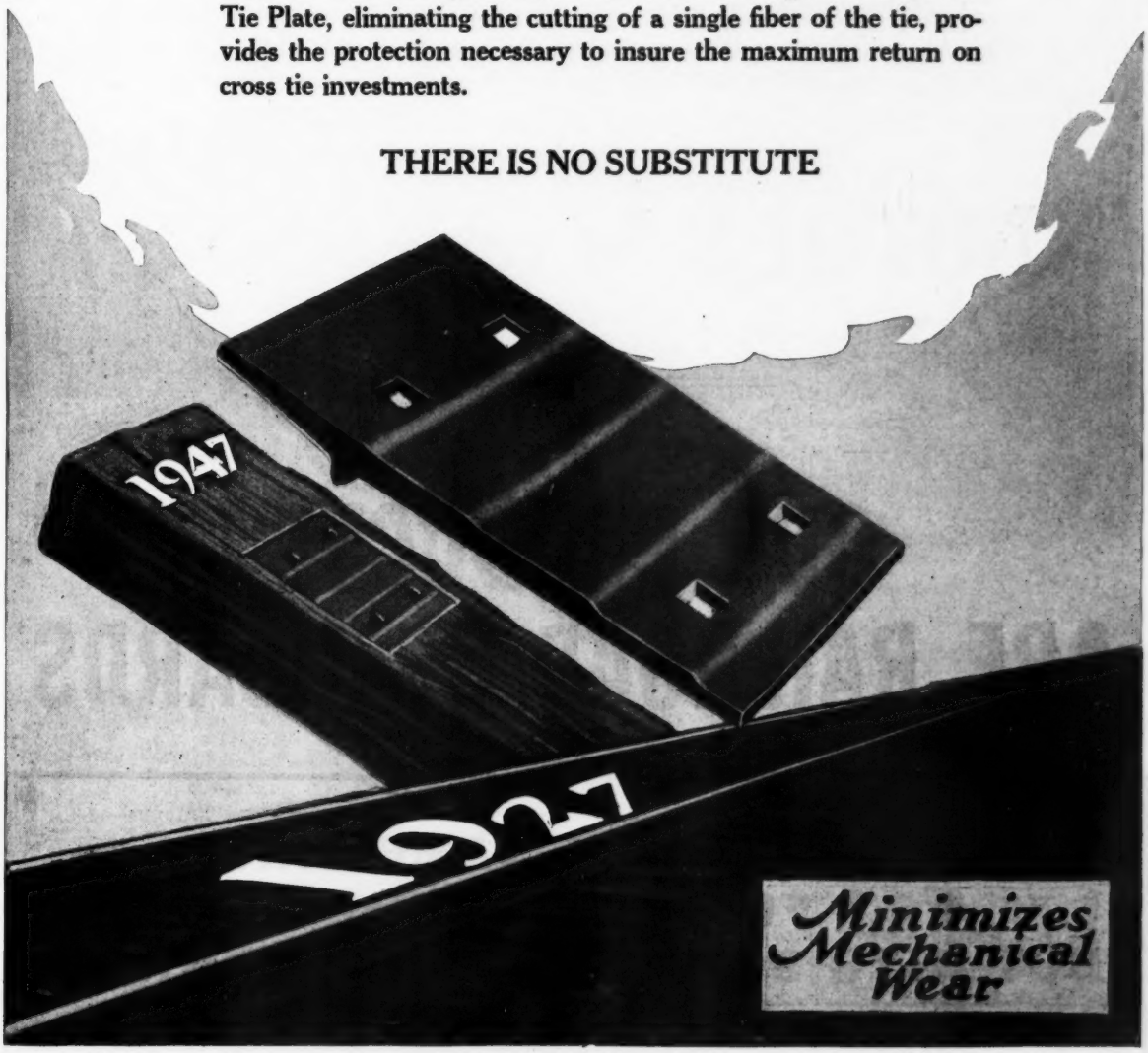
TWENTY YEARS HENCE

RAILROADS each year use an increasing number of treated ties to secure protection against decay and an adequate return on their cross tie investment.

BUT

Statistics show that more ties are removed because of mechanical abrasion than through decay. The scientific design of the Lundie Tie Plate, eliminating the cutting of a single fiber of the tie, provides the protection necessary to insure the maximum return on cross tie investments.

THERE IS NO SUBSTITUTE



The Lundie Engineering Corporation
285 Madison Avenue, New York
166 West Jackson Boulevard, Chicago

LUNDIE TIE PLATE

LEST WE FORGET

WHAT'S ONE MAN'S FOOD IS ANOTHER MAN'S POISON

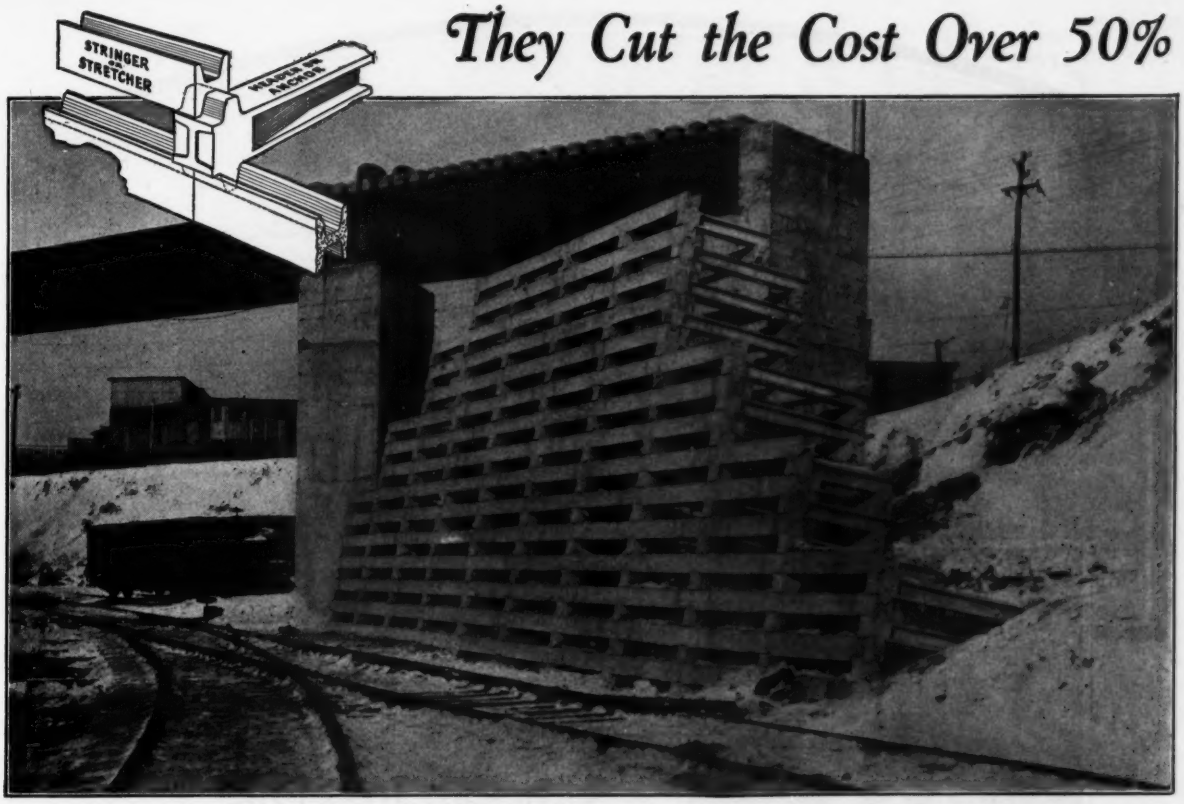
OUR PRODUCTS ARE RAILROAD STANDARDS

NOT WITH THE SAME THING FOR EVERYBODY BUT WITH SOMETHING WORTH WHILE FOR ANYBODY

The Rail Joint Company

165 Broadway New York City

They Cut the Cost Over 50%



One of two new R. C. Walls for the Newburgh & South Shore R. R.—one of the U. S. Steel Corporation's Cleveland subsidiaries

Dirt is Cheaper than Concrete

ENGINEERS and contractors have been quick to grasp the idea that dirt is cheaper than concrete. So, today, they are using dirt for retaining walls—held firmly in place by R. C. Precast Units.

The great strength of R. C. construction is evident in the photograph above. Note how this wall has been built to full height *before* any back-filling was done. Only with R. C. Units is this possible.

R. C. RETAINING WALL UNITS
Are 100% Adaptable

No detail designs are necessary to adapt R. C. Units to your cuts and fills. Common labor places the units and follows with the backfill. No waiting for walls to set. No forms to build and tear down. Our engineers will co-operate with you without charge—to help you cut the cost by using R. C. Units—the *safe* units.

THE R. C. PRODUCTS COMPANY, Inc.
ENGINEERS BUILDING, CLEVELAND, OHIO
New York Chicago Norfolk Indianapolis San Francisco

REG. U.S. PAT. OFF.
PRODUCTS
PRECAST RETAINING WALL UNITS

1. **No Skilled Labor Required.**
   R. C. Units automatically interlock and square away.
2. **No Mason Work**
   No dowels, fittings, pillow or filler blocks.
3. **No Drainage Problems**
   And no massive foundations.
4. **No Salvage Loss**
   R. C. Construction is permanent or 100 per cent salvageable
5. **Assured Results**
   R. C. Units can be specified as definitely as structural steel.

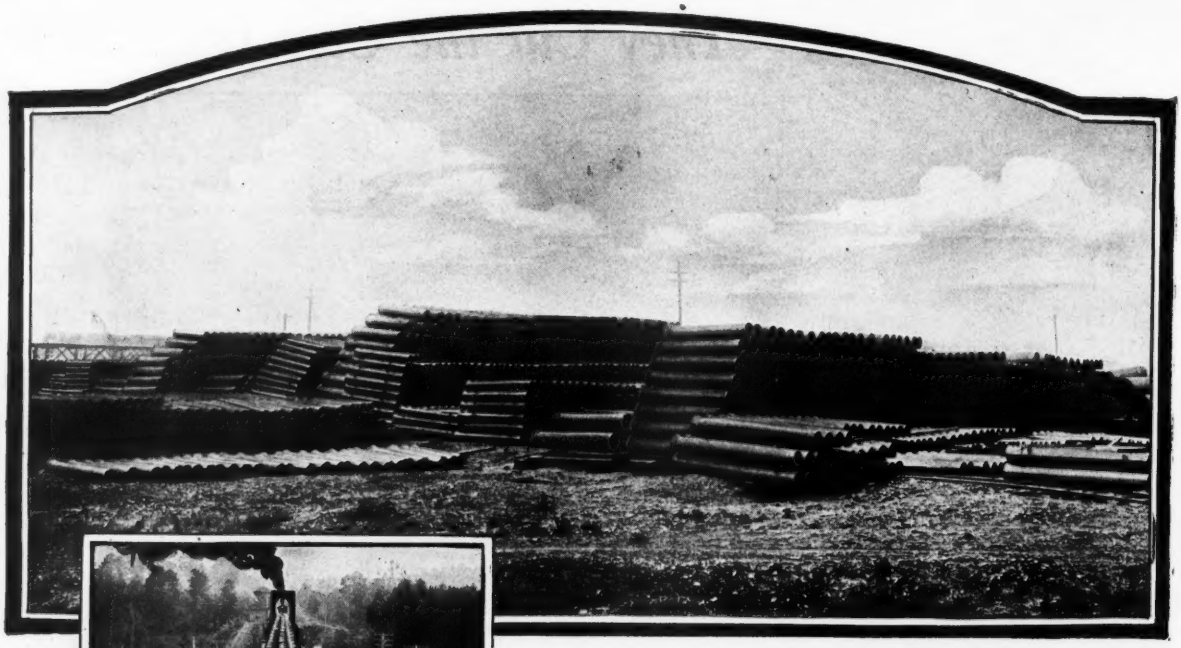
SEND FOR THIS FREE BOOK

The R. C. Book contains illustrations of many typical installations—gives comparative cost figures—shows wall details and gives standard specifications. Also other useful information. Write for a copy—for present use or for your files.

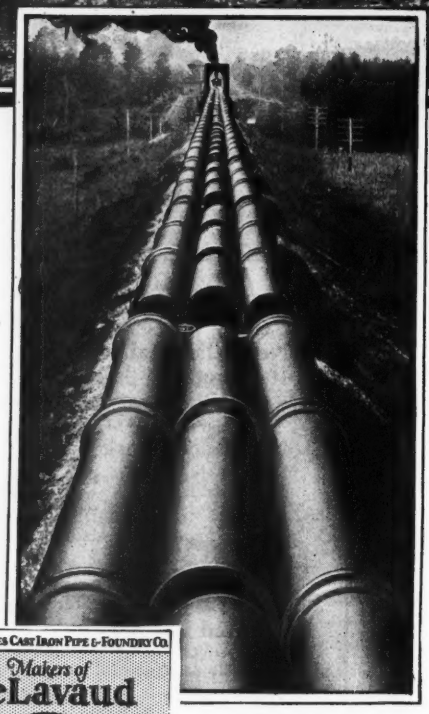
The R. C. Products Co., Inc.
Engineers Bldg., Cleveland, Ohio

Send me your *free* book of Retaining Wall Data ☐
Also complete information on the use of R. C. Units for the following purposes_____

*Company Name*_____
*Individual's Name*_____
*Address*_____



One of our pipe storage yards



A train load of pipe en route

United States Cast Iron Pipe & Foundry Co.
Makers of
deLavaud
Centrifugal
Cast Iron Pipe

U. S. Cast Iron Pipe Foundries are built for mass production

EVERYTHING possible is done to insure early delivery of even the largest contract orders.

Stocks of standard sizes are maintained at our various yards—orders calling for special material are handled promptly. We also have unusual shipping facilities for rail, barge or boat shipment.

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Cleveland: 1150 East 26th Street
New York: 71 Broadway
San Francisco: 3rd & Market Sts.
Pittsburgh: 6th & Smithfield Sts.
Dallas: Akard & Commerce Sts.
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Minneapolis: 6th St. & Hennepin Ave.

A new culvert in 8 hours

"they simply jacked an ARMCO through"

A NEW culvert was needed as an outlet for a summer resort lake in Ohio. An old timber arch 30 feet under a county highway had failed. The new culvert—180 feet of 15-inch Armco Pipe—was in place within 8 hours. A foreman and five men did the work, a sand bag dam holding the water back until the job was done. And the cost of the installation was one-fourth the estimated cost by the open trench method.

This satisfactory result has been duplicated in many other cases—by railway and highway officials. The jacking method not only greatly reduces the cost, but is quickly carried out. There is no traffic interference. And the roadbed is left intact—no backfilling, no settlement.

The easy economical jacking method is applicable also to the placing of culvert pipe under roadways to give additional drainage, or to provide for gas and water mains, electric power line conduits or for any other purpose when an opening must be provided through an existing embankment.

Let Armco engineers help you plan your culvert jacking jobs.

Armco Culvert Mfrs. Association
MIDDLETOWN, OHIO

ARMCO CULVERTS

Consistent performance—
because of consistent uniformity

Write for Bulletin

An informative booklet, "Reducing the Cost of Culvert Placement," gives many interesting facts about this new method. Every engineer and highway official should have a copy. It's yours on request.

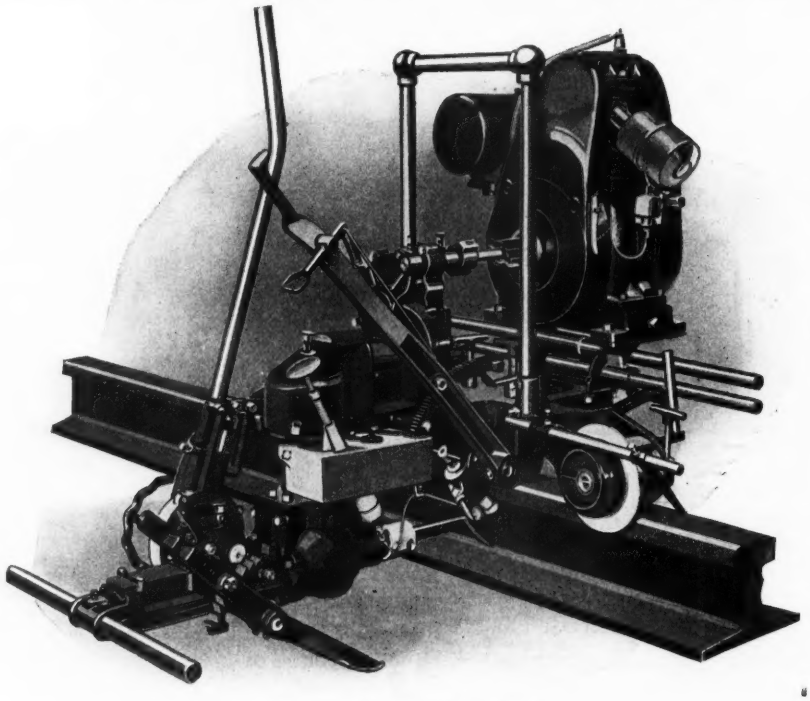
ARMCO CULVERT MFRS. ASSOCIATION
Middletown, Ohio

Send me a copy of your bulletin R-23. I would like suggestions on jacking.....inch culvert under.....foot fill.

Name..... Title.....

Address..... City and State.....

EVERETT POWER M-W TRACK DRILL



(Patents Issued and Pending)

Users estimate their actual savings at from 27 cents to 40 cents per hole. You can no longer afford to drill bolt holes by hand.

RAILROAD ACCESSORIES CORPORATION

Main Office:
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Siemens and General Electric Railway Signal Co., Ltd., 21 Great Queen St., Kingsway, London, Eng., Agents for Great Britain, So. Africa, Australia, New Zealand, India, Argentine Republic, France, Belgium and China

Railway Engineering and Maintenance

Volume 23 February, 1927 Number 2

A DIVIDED RESPONSIBILITY

A TIMELY subject all of the time, like safety, is that of fire prevention. The truth of this is appreciated when it is understood that for the five years previous to 1926 at least, the fire losses on the railroads of the country exceeded $7,000,000 annually, running over $10,000,000 in both 1922 and 1924. With such a fire record, it is evident that every week should be a fire prevention week and that every department should cooperate to the fullest extent to prevent fires. In this, the maintenance of way department is not exempt, and it is the duty of maintenance officers all down the line to consider this subject with that of safety and keep it constantly before their men.

That most fires on the railroads are the result of carelessness or thoughtlessness on the part of someone is generally recognized, this carelessness or thoughtlessness often occuring among otherwise most valuable and experienced employees. A striking example of such thoughtlessness on the part of an experienced employee is illustrated elsewhere in this issue over the caption, "What's Wrong Here?" To this day the man shown in this photograph possibly has not thought of the risk he was taking and may never think of it unless he recognizes himself in print.—Is it not unfortunate that a camera cannot follow us around and record our every-day actions?—The answer to the question raised by the photograph is undoubtedly that the man is smoking as he is drawing a highly inflammable oil—and yet someone else might well say, the omission of a sign on the tank, reading, "No Smoking."

BIGGER AND BETTER TOOL HOUSES

THERE is a frailty in human nature which causes most of us to look for a chance to get something for nothing, although sad experience has taught us that this quest is like that for the pot of gold at the end of the rainbow. So railway officers have learned that economies in labor saving devices are offset in part by such new forms of expense as the interest charges on the investment in modern equipment, increased supervision, etc., and that these added costs must be definitely taken into account when the purchase of new equipment is under consideration. However, changes in practice growing out of mechanical development have taken place so slowly that certain incidental complications may be easily overlooked. For example, the trend toward modern equipment and the increased complexity of the railroad track structure have placed in the hands of the track foreman a much larger variety of tools, appliances and materials than it was necessary for him to have in the old days. Yet many of them are expected to store their entire stock of railway equipment in a house that conforms to a design which was developed years ago when picks, shovels, spike mauls and wrenches were about all that a track gang was supposed to need.

That this condition has imposed a genuine handicap on the section foreman becomes apparent from a reading of the two articles on the foreman as a storekeeper which appear on page 43 of this issue. Bigger and better tool houses cost money; but is this not another of the penalties which the railroads must pay for the privilege of enjoying the economies to be derived from the use of modern appliances?

MAKE A VIRTUE OF A NECESSITY

AN ARTICLE by the bridge engineer of a large eastern railroad, which appears on page 58 of this issue, outlines in an interesting manner the progress which has been made in the application of labor-saving methods to bridge construction. The significant fact brought out in this discussion is that the greatest progress has taken place in those phases of bridge work in which the newer materials of bridge construction have played the important part, namely, steel and concrete. The application of a new idea begets other new ideas. So, as greater use has been made, for example, of concrete, improved methods of building structures with that material have been evolved. In the case of steel, necessity for building heavier bridges has compelled builders to develop equipment with which to handle heavier members. It has also given rise to riveting that would be well nigh impossible without pneumatic tools.

In the building of wooden bridges commendable progress has been made with respect to one feature—pile driving. But in the fabrication of sawed timbers, like almost all carpentry, the methods of today differ but little from those used by the Carpenter of Nazareth. This is in no sense an indictment of the railway's bridge carpenter, because his methods are fully abreast of the practices in other fields of carpentry. The hand saw and the hammer are still the chief implements of the trade.

Therefore, in wooden bridges, as well as in those of steel and concrete, we find that it has been a change in the material used which has been responsible for the first real advance in construction practice that has taken place in many years. Because the use of creosoted wood has placed a ban on cutting in the field, a number of railroads are now framing their bridge timbers before treatment, which means that it is done in the shops with power woodworking machines. Is it not possible that the necessity for this practice in the case of treated wood

points to the desirability of it for all wooden members requiring framing? Instead of trying to improve the trade of carpentry is it not possible to reduce the need for its practice?

THE TUNNEL MAN'S TRIALS

IN FEW fields of construction does modern practice stand out in more marked contrast with the methods of earlier days than in tunneling. Advance in practice in explosives, drilling and mucking has made possible rates of progress in the building of tunnels that were undreamed of in the days of black powder and hand hammer drilling. Tunnel lining work, which is imposed on the maintenance officer almost as often as on the construction man, has also undergone a change. Concrete has replaced brick or stone, and pneumatic equipment for transporting the concrete from a mixer outside the portals has not only brought about a saving in labor but has also greatly expedited the work, since it permits the work to proceed with less interference from the movement of trains. Portable electric light plants make for better working conditions and reduce the hazard of fire in timber linings.

The problem of the maintenance man is confined by no means to the replacement of timber lining with concrete, for, as described on page 60 in this issue, unfavorable conditions arise which call for remedy and repair, and in this field, also, modern mechanical equipment has been of great advantage. But even with the best of equipment repair work in a tunnel through which traffic must be moved with a minimum of interference is exceedingly trying. The work must be done under disagreeable atmospheric conditions. It is subject to heart-breaking interruptions and progress is so painfully slow that only a man of rare courage and leadership can spur his men to wholehearted efforts in the face of discouragement. So while mechanical equipment has proved a big help and cut down the interruptions, it does not alter the basic conditions under which tunnel repair work must be done. Consequently, progress in tunnel repair work must of necessity be gauged with an adequate consideration of the obstacles imposed.

"DAY AND NIGHT, IN BAKING HEAT OR DRIVING BLIZZARDS"

"EYES ON the rail, testing hammer in hand, the track walker by day inspects the railroad's right-of-way and makes minor repairs. At night his task requires even more skill." These words appear under a photograph of a track man in a full-page advertisement of one of the great American railway systems. The purpose of this advertisement, which appears in national publications of wide circulation, was to impress on the reader that the tracks of this road are maintained in a condition that insures safe, comfortable and rapid passenger transportation. But in driving home this message, it paid a glowing tribute to the men responsible for the track as exemplified by the track walker. "Day and night, in baking heat or driving blizzards," it says, "trackmen patrol the right-of-way."

This specific praise of maintenance of way men is not a mere flurry in the imagination of an advertising writer who is looking for "snappy stuff" that can be "put over" with the public. It does "get over," of course, but the reason that it does is because it conforms to the common impression of the duties and responsibilities of the trackmen and bridge men. In other words, it serves to impress firmly in the minds of the reader what he has always believed to be true in a more or less indefinite way.

But the really significant thing about the publication of these advertisements is that they appeared only because every word that appeared was approved by someone representing the management of the railroad in question. Consequently, they represent the attitude of the management toward the faithful employee of the maintenance of way department. Can any better evidence be offered of the high esteem with which these men are held by their roads?

A QUESTION OF ECONOMICS

IN SPITE of the belief that still prevails in many quarters that "It can't be done" more constructive maintenance of way work is now in progress than in any previous winter in history. This record is being made in spite of the fact that in many localities the snowfall has been heavier and has remained on the ground longer than usual. It indicates that by reducing the fluctuations in their forces many maintenance officers are finding the answer to more than one problem which has long confronted them.

If definite proof of the practicability of doing more maintenance work in the winter is desired, one need refer only to the description of the progress that has been made in this direction by the Delaware & Hudson, which appeared in the January issue. This road extends through northern Pennsylvania and northern New York to the Canadian boundary and encounters more than usually severe winter weather. Yet under even these adverse conditions, this road has come to the conclusion that it is warranted in relaying its rail and applying tie plates and anti-creepers during the winter.

In general, those who have done more work in the winter have effected no reduction in the unit costs of performing these operations at that season. In fact in some cases the unit costs have been found to be slightly higher than when the work is done in the summer. However, important economies result from the fact that these operations provide constructive employment during periods of good weather for men who must be retained to cope with storms when they arrive, the savings being shown in the charges for routine track work rather than for rail laying or similar specific operations. Again, by getting rail renewal and allied work out of the way before spring, the peak load of the summer is reduced and it is this last or peak load that costs most by reason of the declining efficiency of labor with increasing demands and the added expenses that must be incurred in housing a large force of temporary employees.

The ideal condition for any organization is a uniform force throughout the year. While the nature of maintenance of way work makes this ideal unattainable in its entirety, it is being approached and to that extent beneficial results are being obtained. Now is the time for those who are yet unconvinced of the merits of increasing winter work to study it thoroughly so that they may determine its practicability with respect to the conditions confronting them. It will be worth while for such men to note the number of days this winter or this month that their men would not be able to work to advantage. And of these days, how many were they required to spend on urgent "winter" work? What really constructive work has the "winter force" done on other than stormy days? Again, what is the cost of recruiting

an organization of inexperienced men to do this work next summer with the possibility of heavy labor turnover, increased inefficiency, etc.? These are questions which may well be studied now in order that conclusions drawn next fall when the winter's program is under consideration may be based on facts and observations rather than on opinions.

THE CROSS-TIE SUPPLY OF THE FUTURE

WHERE are the cross-ties of the future coming from? This is a question that has been thrust at railway men and has been discussed by them for many years. On the one hand is the alarmist who maintains that we are on the verge of a complete exhaustion of our tie supply. On the other hand is the complacent optimist who sees no possibility of a shortage of supply in even the remote future. As with most controversial questions the truth lies somewhere between these extremes.

To the person who maintains that there is no possibility of a depletion of the supply of timber from which ties are produced, one need only point to the rapidity with which our forests are being cut back and the land placed under cultivation and to the great excess of cut over growth from year to year. The alarmist, on the other hand, may well read the paper that E. A. Sterling presented before the Tie Producers Association at its recent convention in Nashville, which paper is abstracted on page 56 in this issue, although it may well be questioned whether Mr. Sterling is not over optimistic as to the future.

No subject is of greater importance to officers confronted with the building and maintaining of railway tracks than that of the future tie supply for more money is spent for ties than for any other single item of engineering materials. Furthermore, while numerous attempts have been made to introduce ties of other materials than timber, the supremacy of wood has not yet been seriously challenged for this purpose.

In studying the tie supply of the future one should not lose sight of the fact that the demands made on our forests are decreasing from year to year by reason of the increasing substitution of competitive materials. Indicative of this transition is the fact that the per capita consumption of timber declined from 510 ft. in 1906 to 348 ft. in 1925. That this decrease will continue is to be expected. Its obvious effect is to leave the forests for those uses in which competitive materials have made the least progress.

There is a still further consideration to be recognized in this connection, namely, the decreasing demands of the railways themselves by reason of the increased life secured from treatment. The railways have been pioneers in extending the life of timber by preservative treatment and an overwhelming proportion of the timber treated has been ties. As a result of this practice the life secured from ties has been doubled and trebled on more than one road with a resulting proportionate reduction in requirements. With the relatively rapid increase in the use of treated ties by many roads in recent years, similar results may soon be expected more generally. It is not beyond the realm of reason to expect that the present annual requirements of from 100,000,000 to 125,000,000 ties will be reduced ultimately to from 65,000,000 to 75,000,000. With the growing substitution of other materials for timber, the increasing attention that is being paid to forest conservation and reforestation and the decreasing demands of the railways for ties, it is reasonable to expect that our tie supply will last for many years, if not indefinitely.

What Our Readers Think

EXCELSIOR FILTERS PROVE WORTH

Omaha, Neb.

To the Editor:

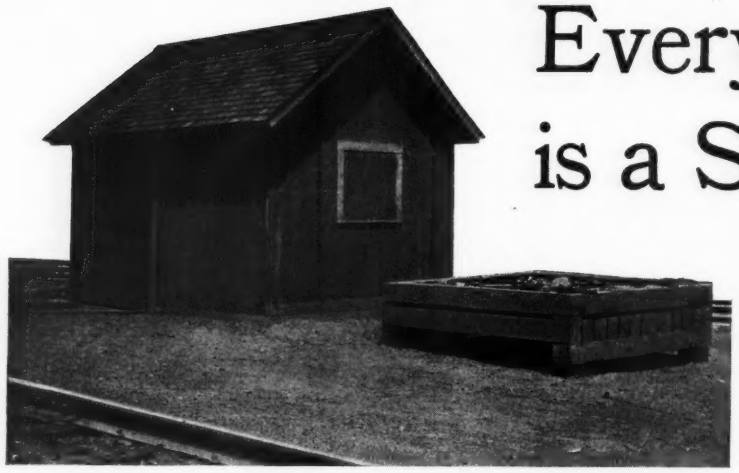
The writer in the "What's the Answer?" department in your January issue who signs himself "Water Engineer" apparently assumes that his statement that excelsior filters are not satisfactory is sufficient to settle the matter. He says, "There is no question but that these excelsior beds do catch quantities of material"; if this is true, as most of us agreed that it is, then it is a question of proper installation and maintenance, if the costs are not excessive. He offers what he calls a plausible explanation for the presence of much material found on top of the filter plates. It seems to me that this is a more plausible explanation of improper installation or poor maintenance.

The proof of the pudding is in the eating, and I believe that if excelsior filters will operate efficiently without attention for eight months a year, it cannot be argued that they are a failure, nor can it be said that, "The excelsior loses its efficiency rapidly and soon chokes up." In nearly every case where we renew excelsior filters at the periods stated, it is done because their efficiency has been reduced to such a point that we consider it economical to make the change, but in these cases the filters have not choked up, and are still operating at the full capacity of the softener. The cases are rare where renewals are made because of choking.

The writer of the article referred to suggests that the better solution is to improve the design of the treating plant or the process of chemical action so that such turbidity can be avoided. My own observation of treating plants operating without any filters, has lead me to the conclusion that no water softener within reasonable cost has yet been designed that will completely and efficiently remove the suspended matter. There are waters where treatment without any filtration is reasonably successful. On the other hand we have many waters that will not completely clarify, even when excess chemical treatment is applied, with eight or nine hours settling. In such cases we have effected clarification with no change other than the installation of excelsior filters. With these facts a matter of record, I hardly feel that we are justified in condemning this method of clarification.

WILLIAM M. BARR,
Consulting Chemist, Union Pacific System.

On the Pasco Division of the Northern Pacific.



Every Foreman is a Storekeeper

What Tools and How Many of Each Kind Should He Have? What Can Be Done to Help Him Store Them in His Tool House?

THAT THE subject of tools for track work is one of vital importance was the conclusion reached in a consideration of tools and tool houses at the meeting of the Maintenance of Way Club of Chicago on December 16. The discussion centered on the answer to two primary questions—(1) what tools does a foreman need (2) how should he store them in the tool house? The answer to the first question is that he needs a greater variety of tools than was formerly considered necessary. This being true, the answer to the second question is that he must be systematic and orderly in the storing of his tools.

The discussion of tools brought out the need of care in supplying tools, since an excessive supply ties up an unnecessary sum of money in surplus equipment, while an inadequate supply causes a waste of labor. As no group of men who are concerned with the use of tools can talk about them without having quality definitely in mind, the relative merits of various grades of tools was also freely considered, it being the consensus of opinion that good quality is of prime importance.

A thorough review of the problem of the tool house showed that many roadmasters and supervisors feel the need of better facilities for the housing of tools. Many tool houses are too small and with the increase in the variety of tools, equipment and materials assigned to track foremen, it is becoming increasingly difficult for them to keep their tool houses in an orderly condition. Some foremen are also in definite need of helpful suggestions from their roadmasters and all of them would be benefited by the development of standard practices and facilities for the stowing and racking of supplies.

Following are abstracts of two of the papers presented at this meeting:

Too Many Tools as Bad as Not Enough

By P. J. McANDREWS

Roadmaster, Chicago & North Western, Sterling, Ill.

OBVIOUSLY local conditions must in large measure govern the distribution and allowance of track tools to section forces. The recommendations of the division officer will usually be found to give as fair measure of the requirements of his territory, and while such recommendations will serve as a guide for another district or division, it may be found that the quantity or in some instances even the type of tool should be varied where conditions differ as to ballast, etc. In one particular, all divisions and all railroads should be alike; this being in the quality of tools or equipment furnished for track maintenance. Only tools of the best available quality should be furnished.

Fortunately those having to do with the purchase of this important part of the railroad's equipment have seen the light and we do not now find in scrap bins and around storehouses and tool houses such frequent evidence of the fact that tools were purchased primarily on the basis of price. When I say we, I mean maintenance men as a whole and not those of any particular railroad. Perhaps we have been furnished poor shovels, inferior track chisels, cheap (and consequently worthless) claw bars in the past for the same reason that some of the roadmasters have often purchased cheap shoes and clothing, which reason is well known to be a financial one, but the writer believes that the reason has more often been the lack of a close contact between the purchasing department and the men in the field.

Marked Improvements Have Been Made

On the systems where executive and purchasing officers have solicited and considered the viewpoints and recommendation of the men in the field there has been a noticeable improvement in the quality of tools, which always means economy even though unit prices may be higher.

While the chance for such a happening is in most cases very remote, it is sometimes well to keep one eye open for the possibility that some supervising officer may not be entirely cured of the silk shirt complex and will order tools in unnecessary quantity and of questionable utility because a high pressure salesman has pictured some tool far above its value in practical service.

We are all intensely human in our desire to possess; some people like to use new things, whether

they be tools, appliances or "what not," and there are sometimes occasions for the exercise of caution in purchasing or recommending the purchase of an untried or undeveloped tool of current year model, when one of the earlier models will serve as well. We must, however, be always on the lookout for the new idea of real merit.

The Requirements of a Section

Now that we are getting good tools, how many should each section gang have and what are the essential items which must be furnished? I believe that the staple items of tools should be furnished approximately on the following percentage basis for men employed under normal conditions:

Shovels	100 per cent,	including foremen in small gangs.
Picks, tamping	100 per cent	
Picks, earth	100 per cent	
Track wrenches	60 per cent	
Spike mauls	60 per cent	
Ballast forks	100 per cent	
Tie tongs	50 per cent	
Claw bars	25 per cent,	but never less than 2.
Rail tongs	50 per cent,	but for large yard gangs never more than enough for one tong gang to handle heavy rails, frogs, etc.
Lining bars	100 per cent	(except where track liners are furnished).
Adzes	25 per cent	
Scythes and snaths	80 per cent	

For track gangs varying between minimum winter forces of two to four men and average summer forces of 6 to 10 men, a number of other articles are suggested as follows:

Track gage	1	
Chisels, track	6	
Sledge	1	
Track level	1	
Spot board	1	Small adjustable boards should be supplied.
Track drills, manual	1	For alternate sections.
Tool grinder	1	The furnishing and use of grindstones are recommended where mowing of right-of-way is practiced.
Track liners	3 to 7	
Track jacks	2	
Spike puller	1	
Track punch	1	
Wheelbarrow	1	
Fence tools, as required.		

There are various additional items, the use of which may be necessary under certain conditions, depending in a measure on the degree of refinement desired and the territory in which sections may be located, as well as the nature of the organization itself, such, for example, as whether track forces or bridge and building forces maintain street and highway crossings, etc.

The List Is Not Complete

The above list is incomplete and is not intended to include yard sections, which require a larger number and a greater assortment of tools. Every section having to maintain switches should have frog wrenches and a small kit of suitable tools for applying, removing and adjusting switch rods, etc., as much time may be wasted in doing such work with unsuitable tools.

To avoid keeping an excessive number of tools on any one section I believe that where there is not a convenient local or division storehouse, the roadmaster should arrange to keep a sufficient emergency supply at his headquarters to enable him to increase the tool equipment on sections when such action is necessary, this emergency supply to be applied in filling regular requisitions near the close of the season if the stock is thought to be larger than will be needed during the season when forces are reduced, as is too often done at present.

There is and has been considerable discussion from time to time as to the allotment of tools; the better way is to analyze the situation and form a conclusion after the study of certain controlling principles.

What an Excess of Tools Means

To illustrate how excessive tools may lead to waste, I will take the case of one railroad, the Chicago & North Western. If one shovel in excess of the requirements were placed on each of the 1,508 sections on that system, we would have just four

Two Neat and Well Maintained Tool Houses

less than 126 dozen idle shovels back in the corners of the tool houses, rusting their lives away in idleness.

I believe that if I were placed in a position where my duties required me to superintend a division, I would make it a point to visit each tool house without the foreman having any advance notice that would give him a chance to "slick" it up, because the condition of the tool house would not only give me a fair idea of the efficiency of the foreman and a measure also of the degree of supervision given by roadmasters and storekeepers in the distribution of tools and material. In most cases such work as the close checking of tool houses is not done because the track supervisor or roadmaster is overloaded with other duties that appear to him to be more essential, although they are not usually more intimately connected with the pocket book of the railroad.

Too Few Also Costly

There is also another side of the picture which is presented in cases where some one, often bubbling over with enthusiasm and an imaginary knowledge, tells us that we cannot have the necessary tools. We sometimes find a gang short of tie tongs, with the result that the laborer sticks his pick into a first-class treated tie, or he walks back several rail lengths to get a pair. In the former case, he has shortened the life of the tie a year or more and in the latter case he has wasted five or more minutes of his own time as well as that of his partner who is standing idle waiting until he gets the tongs.

Suppose a system using about a million ties a year has 25 per cent of them damaged by the use of improper tools—dollars are lost. Suppose that on the 1,508 sections of the Chicago & North Western a

loss of 10 min. per section per day results from walking back and forth after tools (it does not happen because we get all the tools necessary), this would lead to a waste of 251 man hours or a money loss of $95.38 per day or $2,479.88 per month of 26 days. Suppose again that because of having poor claw bars we reduce the efficiency of our men even 1 per cent —more dollars paid out and charged to the immense account of maintenance.

The use of power drills should be made more general. Gasoline engines on motor section cars may be utilized to generate electric power to drive a drill, or where air is available an air drill may be used to advantage. In material yards located convenient to shops air may be piped to rail piles, and by using a torch to cut bad ends off the rails and drilling with a power drill, much relay rail may be salvaged for use in many side tracks.

Yard Gangs May Need Several Sets of Tools

Yard gangs should be provided with timber-carrying hooks for the safe handling of switch timbers which they must use in greater quantities than outside sections. In large yards it may be economical and no doubt often necessary to have several sets of tools, owing to the difficulty of moving tools or track cars through yards to the points where work is to be done.

With the equipment available at present, such as gasoline propelled cranes, capable of handling any ordinary material, and also of pulling other cars of material or men from a tool house or material yard to the working point, working conditions may be changed to a great extent. There are on the market gasoline-driven cranes that will handle an ordinary flat car. A foreman may load his material on such a car with the crane, take the material to the working point, use the crane to place it, and then load the material removed from the track and take it back to the material yard, making possible a complete job without the use of a work train. Locomotive cranes are being used extensively for this kind of operation, but usually the operating expenses for a steam-driven crane exceeds that of the gasoline-driven outfit in the same service.

Tool Houses

Tool houses constructed in years past to house a hand car and the tools in use at that time are not large enough, as a rule, for present day needs or present day methods of caring for tools and materials.

An Example of Slovenly Storage of Tools

Tools should be properly racked when not in use, bolts sorted in racks marked for different sizes, and other material properly cared for. There should be room enough around the motor car so that the men can clean and repair it properly in the house. Trackmen should not be required to care for their equipment in an obsolete shanty.

Tool houses are the most common building on the railroad right-of-way, more common even than depots, and neat appearing buildings with the necessary materials kept in an orderly manner help to make a good impression on the observing traveler. While an inspection of the interior of a tool house will disclose a slovenly foreman who lacks interest in his work, so in a large measure may a management be judged by the appearance of the buildings on the property. Poor depots and poor tool houses may mean poverty, but good depots and poor tool houses in our judgment indicate a lack of thorough understanding between executive and maintenance departments, and often a lack of appreciation for maintenance men and their problems. While in time of

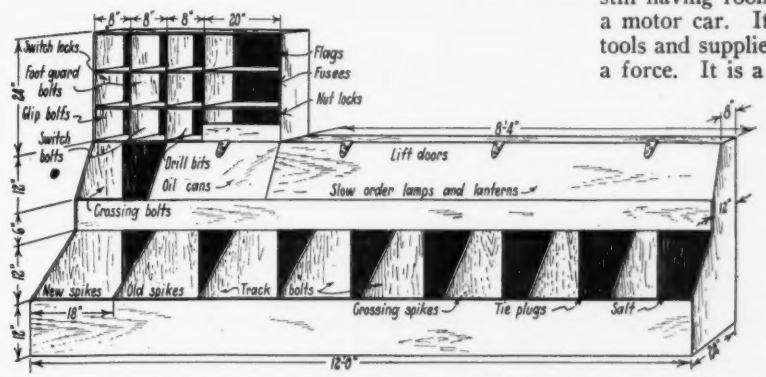
storm or stress we are expected to be the big brother of the family, things are often different when we want to dress up and we become a sort of Little Orphan Annie. Give the trackmen enough good tools and a suitable place to care for them and it will be found that they will appreciate to a greater extent how real a part of the railroad organization they are and become better producers.

Make the Foreman a Good Housekeeper?

By JAMES SWEENEY

Supervisor of Track, Chicago & Eastern Illinois, Danville, Ill.

YOUNG MEN in maintenance work cannot be expected to get us as much enthusiasm for the tool house as older men who know how much the hand car house was appreciated when the railroads first began to provide them. In the early days, there wasn't any hand car house but just a timber runway for the car and a box for the tools. Usually this was only an ordinary covered box about 2 ft. by 2½ ft. by 6 ft. in dimensions, resting on old ties. When we came in of a winter night (and I mean night, for we worked 10 hours), we were glad enough to get the tools into the box in any way that would let the lid go down. The hand car, of course, stayed out like a poor man's horse and looked about that way in the morning. Often it was necessary to chop ice for a quarter of an hour to get the car in shape so the tools and men could stay on it. If it had "snowed and blowed" there was another job pulling the tools out of the box.



Form of Tool House Cupboard Used on the Chicago & Eastern Illinois

Now, of course, a hand car house isn't a palace, but anyone who, after years of the old order of things, had the experience of running a hand car into a brand new shack just big enough to hold it, where he could let it stand and go home, knowing that the car and the tools would be right there in the morning ready for business, is bound to have a tender spot in his heart for it.

But aside from sentiment, the car house is the section gang's shop. Occasionally one will find a foreman here and there who has advanced ideas and will bring all of his work to the shop. As a rule, also, the men are appreciative of a good car house and the stove that now goes with it. Many of them have a natural bent for keeping things in order and could go into the place at night without a light and lay their hands on anything they might need.

However, when we attempt to store all the tools and supplies needed by a yard gang, it requires more than a natural ability to hang things around and the foreman needs the help of some systematic plan, for the nature of the work expected of a yard gang of, say, 10 men is rather extensive. If there ever were a "jack of all trades and master of many," the yard gang foreman in a small terminal certainly qualifies. He is called upon to assist in all kinds of main line work as well as yard work and must have tools for surfacing and lining, mowing right-of-way, laying rail, ditching, building fences, transferring freight, cleaning cars, cleaning up and rebuilding tracks at wrecks and other jobs without end.

The list of tools given here is what I consider a full complement of tools for a gang. Large as the list is, there is not an item that I consider unnecessary, but think of one section foreman storing all those tools and still having room enough left to house a push car and a motor car. It is a task to care properly for all the tools and supplies necessary for the many needs of such a force. It is a part of the work which must be reckoned with in the cost of track maintenance. That one man will find odd bits of time in which to do it while another must frequently assign a man to it, along with other routine work, is just another indication of one man's superior ability over another. Much of the trouble the foreman encounters in finding a proper place to house his tools and supplies can be overcome by suitable racks and cupboards. The Chicago & Eastern Illinois has a standard plan for such racks, as shown in the illustration.

Certain things are fundamental in storing different tools. For example, in every tool house there should be a set of closets in which to keep a large amount of the smaller materials. This closet should contain bins for spikes, bolts, nutlocks, tie plugs, waste, oil cans, lanterns and a metal lined drawer or chest for torpedoes and fuses. There should be a timber rack along the wall to hold the lining, nipping and claw bars and another for tamping bars.

Tamping and clay picks should be kept in a space provided near the floor, as these are dangerous tools to hang overhead. The best method for keeping spike mauls, chisels and wrenches is to hook them in a slotted 2 in. by 4 in. timber secured to the wall. Extra handles for mauls, sledges, picks and adzes should each have a brad driven in the smaller end and be hung on a string from the ceiling, because laying them down causes them to warp.

All cans containing oils should be kept in a metal lined box outside of the tool house to reduce the hazard of fire. Smaller tools like drill bits, files and flags should be kept in a pigeon hole rack where they can be readily found. Tool grinders, rail drills and rail benders should always be kept under shelter, as these tools will rust and corrode if left outside. Such tools as scuffle hoes, rakes, the level board, spot board and snow brooms, may be kept overhead since they are not heavy tools

and are not so liable to fall. Shovels, ballast forks and scoops should be hung on racks provided along the walls.

Provision should be made for storing track and car scrap in a bin constructed outside and near the tool house. If desirable, car scrap and track scrap may be kept separate by a partition in the center of the bin.

The method to use in keeping the tool house in order is hard to develop. I find from a study of the characteristics of my foreman that some are easily humiliated while others have to be driven into keeping a tool house clean. A good practice to follow is to have the tool house cleaned and swept out at least every three days and if possible impress upon the foreman that the condition of his tool house is a measure of the way he keeps his home and maintains his track. Each foreman can, if he will, find the opportunity to keep the place ship-shape. The hardest task of all is to get him to want it that way.

Tools and Equipment Required by Track Gangs

Kind of Tools	Number of Tools for Gangs Consisting of a Foreman and the Number of Men Shown Below			
	4	6	8	10 (yard)
Adzes, with handles	4	4	4	8
Axes, with handles	1	1	1	2
Ballast forks (where needed)	4	6	6	6
Bars, claw	2	3	3	4
Bars, lining	....	....	....	....
Bars, nipping	4	6	6	6
Bars, tie testing	2	2	2	2
Brooms, rattan (for summer)	2	2	2	4
Brooms, rattan (for winter)	6	8	12	24
Cans, oiler	1	1	1	1
Cans, one gallon (kerosene)	1	1	1	1
Cans, two gallon (gas engine oil)	1	1	1	....
Cans, five gallon (gasoline)	1	1	1	....
Cans, five gallon (road oil)	1	1	1	1
Cans, five gallon (line shaft oil)	1	1	1	1
Chains (for locking cars)	2	2	2	3
Cars, push	1	1	1	2
Cars, hand	....	....	....	1
Extra hand cars to be located at certain points, to protect motor car failure				
Cars, motor	1	1	1	....
Chisels, cold	2	2	2	4
Chisels, track (if new)	4	4	4	6
Chisels, track (if repaired)	8	10	10	12
Drills, track	....	....	....	1
One drill and a complete outfit of bits to be located at convenient point, so they will be available for two or three sections				
Drill, bits 1 in.	....	....	....	2
Drill, bits $\frac{7}{8}$ in.	....	....	....	4
Drill, bits $1\frac{1}{8}$ in.	....	....	....	2
Drill, bits $1\frac{1}{8}$ in.	....	....	....	2
Forks, rail	1	1	1	2
Files, 18 in. mill	1	1	1	2
Flags, red	4	4	4	4
Flags, green	2	2	2	....
Flags, yellow	2	2	2	....
Funnels	....	....	....	2
Tool grinders	1	1	1	1
Handles, adz	2	2	2	4
Handles, axe	1	1	1	1
Handles, pick	2	2	2	6
Handles, maul	4	6	6	12
Hand axe	1	1	1	1
Hoes, scuffle	5	7	8	....
Hooks, timber	....	....	....	3
Jacks, No. 1 track	2	2	2	2
Jacks, No. 6 track	....	....	....	2
Jacks, screw (for lining railroad crossings)	....	....	....	2
Kegs, water (with dipper)	1	1	1	1
Lanterns, signal (complete) red	2	2	2	2
Lanterns, signal (complete) white	2	2	2	4
Lanterns, inspectors' (complete)	2	2	4	6
Lantern globes (red)	2	2	2	2
Lantern globes (white)	1	1	1	1
Lantern globes (inspectors')	1	1	1	2
Levels, track	1	1	1	2
Lines, ditching (300 ft., ¼ in.)	1	1	1	1
Mauls, spike	4	4	6	8
Mattocks	1	1	1	1
Picks, clay	4	6	6	8
Picks, tamping	2	4	4	4
Pike poles (where needed)	4	4	4	4
Pliers	1	1	1	1
Post hole digger	1	1	1	....
Punch, track	1	1	1	1
Rail bender	....	....	....	1
One to be located at convenient point for use on two or three sections				
Rakes	1	1	1	1
Spot board	1	1	1	1
Surfacing blocks	2	2	2	2
Saw, hand	1	1	1	1
Saw, crosscut	....	....	....	1
Scythes, complete, weed	3	4	4	6
Shovels, scoop	4	4	6	8
Shovels, No. 2 (tamping)	5	7	8	10
Shovels, No. 2 (old—not fit for tamping)	4	4	4	6
Signals, standard caution (yellow)	2	2	2	2
Signals, standard caution (green)	2	2	2	2
Signals, day only (yellow)	2	2	2	2
Signals, day only (green)	2	2	2	2
Sledges (with handles, 14 lb.)	1	1	1	1
Spike puller	1	1	1	2
Tape lines (50 ft.)	1	1	1	1
Tongs, rail	2	2	2	6
Tongs, tie	4	6	6	8
Torpedoes	12	12	12	....
Fusees, red	6	6	6	....
Track gage	2	2	2	2
Scythe stone	3	4	4	6
Wrenches, monkey (12 in.)	1	1	1	1
Wrenches, monkey (18 in.)	1	1	1	1
Wrenches, track (1½ in.)	2	2	2	4
Wrenches, track (1¾ in.)	4	6	6	6
Wrenches, track (2 in.)	2	2	2	2
Wheel barrow	1	1	1	2
Wire stretchers	....	....	....	....

El Navajo Hotel on the Santa Fe at Gallup, N. M.

Where the Locomotive Crane Is Better Than the Jack for Raising Track

An Interesting Case of Subsidence Is Encountered in Ohio

Baltimore & Ohio Has Difficulty in Maintaining Old Track Over a Bog While Grading for New Second Track

THE BALTIMORE & Ohio has recently completed and placed in service 7.2 miles of second main track extending easterly from Sterling, Ohio, in a new location, in the construction of which considerable trouble was experienced with the subsidence of the embankments for both the old and new main tracks. In certain swampy sections the hard ground was overlaid with a deposit of soft peaty material to a depth ranging from 48 to 52 ft., a total of 119,000 cu. yd. of material being placed in sinkholes below the original surface of the ground. Prior to this work, the two main tracks diverged at a point about 3.5 miles east of Warwick, as is shown on the accompanying plat, reaching a maximum divergence of more than one-half mile between Easton and Rittman, and coming together again at a point about one mile east of the station at Sterling.

The westbound main track within the limits of the new work was formerly a part of the Akron & Chicago Junction, which was acquired by the Baltimore & Ohio shortly after its construction in 1890, while the eastbound main track was formerly a part of the Cleveland, Lorain & Wheeling, built about 1875 and acquired by the Baltimore & Ohio in 1901. This latter stretch of track was located through the valley of Big Chippewa creek, much of which is low and flat, with considerable areas of bog and swamp land, and subject to overflow at times of heavy rain because of the small amount of fall in the creek. Litigation on this account has been almost continuous since the construction of the line, the owners of adjacent property claiming that the roadbed acted as a dam to cause or augment flood damage. This track had 12 bridges ranging from a 14-ft. I-beam span to a timber trestle with an opening of 101 ft., eight of the bridges being of timber construction, while four had been rebuilt in concrete and steel. Two of the bridges were over Big Chippewa creek and one spanned Little Chippewa creek a short distance from its confluence with Big Chippewa. The westbound main follows the northerly edge of the valley and is for the most part on higher ground except for a distance of about 1,500 ft. on each side of bridge No. 103, when the land is low and swampy. The portion of this track within the limits of the new work had only five bridges, two of which were of steel and concrete while the others were timber structures, two of them with one span only, while the third was 46 ft. long.

Decision Is Made to Relocate Eastbound Main

Early in 1925 the Baltimore & Ohio decided on a program of improvements to permit the operation of heavier power over the main line of the Akron division and studies in connection therewith developed that it would be economical to relocate the eastbound main track east of Sterling to bring it adjacent to the westbound main. The advantages gained by this plan were as follows: (1) The probable elimination of further litigation on account of flood damage in Big Chippewa valley; (2) the elimination of an expenditure of $250,000 for eight new bridges on the old eastbound main and the substitution therefor of an expenditure of $80,000 for the reconstruction of five bridges on the westbound main for second track; (3) the elimination of several grade crossings on the old eastbound main track, including one at Easton on the state highway which was regarded by the State Highway Department as sufficiently hazardous to justify immediate grade separation at a cost of approximately $125,000; (4) simplified transportation and switching conditions, together with a reduction in maintenance expenses; and (5) more convenient shipping facilities for the general public and the industries, all of which were located on the westbound main track.

Because of these advantages it was decided to relocate the eastbound main track. A consultation with the property owners and the county commissioners dis-

closed that they were unanimously in favor of the abandonment of the old line and in a formal agreement the Board of Commissioners for Wayne County and the land owners as individuals released the company from any future claims for flood damages after the old line should have been abandoned, the adjoining property owners agreeing to purchase for a nominal consideration the old right-of-way after the railroad company had salvaged its material therefrom. The contract for the work was let early in August, 1925, and operations were started on August 30.

Subsidence Was Anticipated

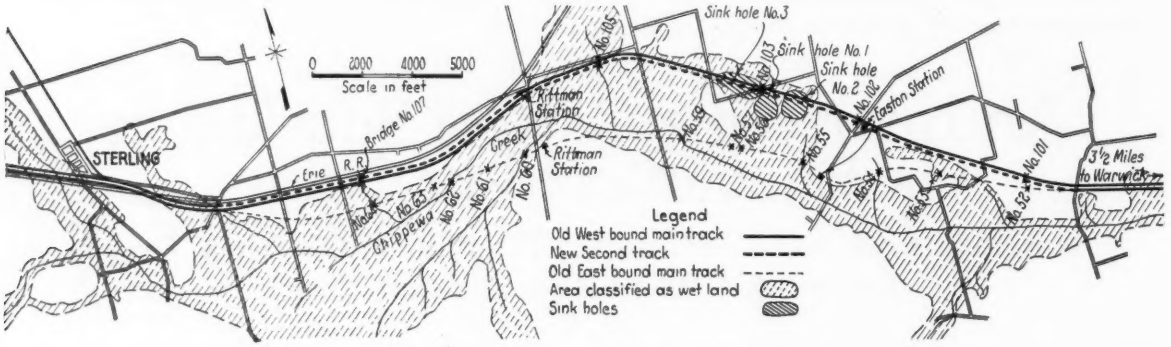
It had been anticipated that some difficulty might be encountered with subsidence in the vicinity of bridge No. 103, since the old westbound main track had shown a decided tendency to settle for a distance of about 100 ft. west from the bridge and at another point about 700 ft. east of the bridge from the time the Baltimore & Ohio purchased the road, but owing to the absence of the original construction records the full nature of the underlying material was not known. The track at the points designated often sank very abruptly and frequent lining and surfacing was necessary to keep the track in condition for the traffic, even with slow orders. During the progress of the maintenance work large quantities of cinders had been used at these two points and finally, in 1923, the embankment became sufficiently stable to permit the resumption of high speeds, although more attention to maintenance was required than on other parts of the line.

The pile bents of bridge No. 103, which consisted of one span, had been settling for years and the superstructure was carried on a succession of 12-in. by 12-in. caps which had been superimposed on the original caps In attempting to drive piles for falsework to permit the construction of a concrete bridge to replace the old pile structure it was found that they brought up on timber about 5 ft. below the base of the rail and further investigation showed that timber was present under the embankment over the entire 3,000-ft. stretch of swampy ground at depths ranging from 4 to 7 ft. As has been said, no records of the original construction were available, but from an old resident who had worked on the building of the line it was learned that a brush mat had been made to cover this stretch, on which was laid a corduroy of logs several feet in thickness. On this corduroy a layer of heavy clay, approximately 2 ft. thick was placed by laborers with wheelbarrows, the fill then being carried up with lighter material, placed in the same manner. Long test piles driven along the south side of the westbound roadbed encountered stable ground at depths varying from 48 to 52 ft. Since piles could not be driven through the corduroy and since the depth of the soft material precluded the construction of a cofferdam without a prohibitive expenditure it was decided not to build a concrete bridge but to install instead two rows of 55-in. concrete pipe after the fill for the new double track had settled and to install additional concrete pipe culverts through the roadbed within the limits of the swampy land.

Grading Methods

The grading for the new work was light, the excavation consisting of small cuts containing a total of only 25,000 cu. yd., in addition to which it was estimated that 30,000 cu. yd. of borrow would be necessary, exclusive of what might be required for subsidence in the swampy section near bridge No. 103. Because of the unstable character of the bog, the natural clay and loam adjacent to the line were not regarded as suitable filling material and a gravel hill was purchased as a borrow pit. This hill was located near Crystal Springs, on a branch line south of Warwick, and involved an average haul of 12 miles to the work. Grading was started with two steam shovels, one at each end of the work, excavating the small cuts along the line and loading the material on 20-yd. dump cars in which it was hauled to the nearest point where filling was required for the roadbed of the new track. About 75 per cent of the estimated quantity of borrow was needed for the new roadbed over the swampy land, and since traffic was very heavy every effort was made to complete the new eastbound track between the east end of the improvement and bridge No. 103 to avoid the necessity of the trains from the gravel pit returning to the pit via Sterling and the old eastbound track, which would require an additional movement of nine miles for each train so handled.

As soon as the cuts for the eastbound track had been removed a 70-ton Bucyrus shovel was started at the borrow pit, 26 air dump cars of 20-cu. yd. capacity being placed in service to haul the material to the new roadbed. Fill for the new eastbound track was deposited from the westbound main track over the entire length of the swampy ground until sufficient width was obtained on which to lay a construction track for the operation of gravel trains. This fill, except in the immediate vicinity of bridge No. 103, held fairly well for the operation of gravel cars but not for engines during the period required to make the new fill at bridge No. 103. To facilitate the making of preliminary investigations and also to permit filling to proceed at bridge No. 103 prior to the completion of the new second track from the east end to that point, a construction



Location of Old and New East Bound Main Tracks

track with a trailing point switch had been installed on the south side of the westbound main immediately east of the bridge and a portion of it extended over the soft spot which was afterwards designated as sinkhole No. 1. The track over this soft spot was used for gravel cars only and locomotives were not allowed on it.

Subsidence Begins on New Embankment

A few days after this construction siding was placed in service a small crack was noticed along the south end of the ties of the westbound track for a distance of about 120 ft. east of bridge No. 103. This crack widened perceptibly within a few minutes and the track gang in the vicinity was summoned at once to remove the construction siding from that portion of the fill, but before the track material had been removed entirely the fill had disappeared beneath the surface of the water which was approximately seven feet below the former base of rail. In attempting to build up the fill by dumping cars from the westbound main track it was found that the backwash caused by the material striking the water was so severe as to wash away the loose slag and cinders comprising the roadbed for the westbound track and threatened to undermine it. To prevent this action a row of piling was driven parallel to the westbound track, about 16 ft. from the center line, the piles being spaced about five feet apart, and old timbers were placed behind the piling to form a bulkhead to prevent backwash. This arrangement was effective except at the center of the sink hole where recourse was had finally to a construction trestle for the gravel cars.

Making Fill with Side Dump Cars

As the filling material was dumped into the sink hole the swamp land south of the roadbed gradually rose above the water until it reached an elevation of about 12 ft. above the water line, or 5 ft. above the base of the rail, the area affected covering approximately three acres, all of which was thickly wooded with trees up to 12 in. in diameter. As the ground rose cracks developed on its surface, some of them having a width of eight feet. Examination of these cracks showed that the material consisted of decayed vegetable matter very light in weight and combustible when dried, and that the swamp had the general characteristics of a peat bog. A county road crosses the right of way at bridge No. 103, being carried for a distance of about 400 ft. south of the tracks on a mat of old timber. The raising of the surface of the swamp carried the road with it and tilted the mat on end, completely destroying the road, while a county drainage ditch, which extended southeasterly from bridge No. 103, was entirely closed and obliterated for a distance of more than 400 ft. from the right of way.

A total of 40,000 cu. yd. of filling material was required at sink hole No. 1 before it was completely stabilized. While this material was being deposited no great difficulty was encountered in maintaining the westbound main track although it was necessary to line and surface it frequently. After the filling for the roadbed has been completed the county road was restored across the disturbed portion of the bog by the same methods as had been used in its original construction, a timber mat supporting good filling and surfaced with granulated slag.

Subsidence in Sink Hole No. 2

Just when the fill was completed at sink hole No. 1, a crack developed along the south end of the ties of the westbound main track over a distance of approximately 200 ft. centering about 800 ft. east of bridge No. 103, and designated as sink hole No. 2. Within a few hours after this crack was detected the new eastbound roadbed started to sink and quick action was required to salvage the material in the construction track which had been in operation for nearly 10 weeks. The fill sank beneath the surface of the water, similar to the behavior of the fill at sink hole No. 1 and the same difficulties were encountered with backwash when filling operations were resumed. The westbound main was finally shifted four feet to the north and a construction trestle 120 ft. in length with long piles, was built on the center line of the eastbound main from which to dump the cars. The outside row of piles of this trestle was sheathed with 3-in. plank and the trestle filled with granulated slag to act as a bulkhead against the backwash. It was not possible, however, to place the sheathing low enough to form a perfect bulkhead and after filling was resumed the material continued to be washed out from under the construction trestle. Finally a row of piles was driven well out on the slope of the new fill with brush and logs placed between these piles and the trestle. The brush and logs deposited in this manner continued to disappear every few days and more were placed until a total of 75 trees had been placed and pushed into the swamp. As in the case of sink hole No. 1 the surface of the swamp rose above the water level, reaching a maximum height of about 15 ft., or 8 ft. above the base of the rail. The area affected covered about two acres, all heavily wooded.

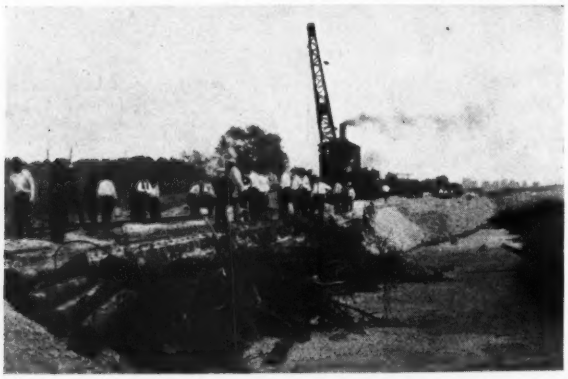
Upheaval of Adjacent Ground

Just when it seemed that the new fill in sink hole No. 2 was coming to rest, the westbound main track began to sink and to go out of line, while the swamp land on the north side of the track began to rise over an area of approximately one-half acre. The track was raised

and surfaced on granulated slag, a night and day force being necessary to keep the track in condition for the heavy traffic, which often amounted to 35 trains during the 10-hour working periods, and which was handled with no delays other than those occasioned by slow orders. The track was raised in successive lifts aggregating 54 ft. and while some of the material undoubtedly was pushed out into the swamp it was estimated that the new fill for the westbound main over sink hole No. 2 had a depth of not less than 40 ft. The original corduroy at this point was approximately five feet below the base of rail and when settlement finally ceased no trace of it could be found at a depth of 25 ft. A total of 25,000 cu. yd. of filling material was placed in sink hole No. 2 in addition to 7,500 cu. yd. of granulated slag required to keep the westbound main in service.

Subsidence at Sink Hole No. 3

While solid fills were being made at sink holes Nos. 1 and 2, all other work on the entire improvement had been completed except that portion of the fill in sink hole territory west of bridge No. 103, a distance of approximately 1,600 ft., which was termed sink hole No. 3. From the experiences at sink holes Nos. 1 and 2 it was anticipated that further difficulty would be experienced on this section of the work, although some filling material had been deposited over this territory soon after construction was started and had carried a construction track for gravel cars for a considerable period of time. The weight of the additional material now deposited was sufficient to cause subsidence similar in all respects to that encountered at sink holes Nos. 1 and 2. The work here was carried on in short stretches of from 300 to 400 ft. in length, working westerly from bridge No. 103. No bulkhead piles were driven in this section but brush and trees to the number of 350 as well as large quantities of old bridge timbers,

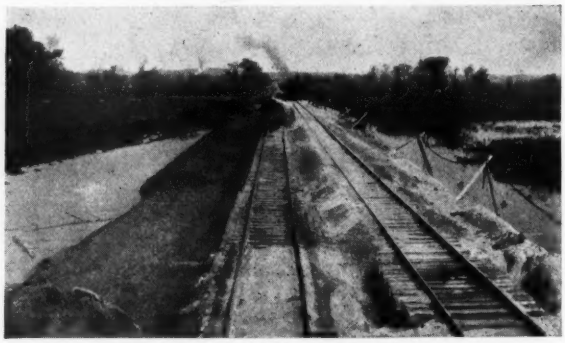


Logs and Brush Were Used to Protect the Old Bank

ties, etc., were used to form mats to prevent the backwash from undermining the westbound roadbed.

At a point approximately 300 ft. west of bridge No. 103 the westbound main track began to settle and go out of line with results similar to those encountered in sink hole No. 2 and this condition extended over a distance of about 1,000 ft., the main track sinking and the surface of the swamp rising on the north side of the roadbed. A maintenance force working night and day kept the track in condition for the passage of trains. Approximately 54,000 cu. yd. of fill were deposited in sink hole No. 3 before a solid roadbed was obtained for the two tracks and 21,600 cu. yd. of granulated slag were used in maintaining the westbound main track for continuous operation.

Aside from the grading and track laying the principal work involved in the relocation of the eastbound main was the replacement of the timber bridges on the westbound main with concrete and steel structures for double track and the extension of two concrete and steel bridges to accommodate the second track. The work involved in these changes was as follows: Bridge No. 101, formerly a 16-ft. wooden pile trestle, was replaced with a double concrete box culvert with openings of 5 ft. by 8 ft.; bridge No. 102, a 46-ft. wooden pile trestle, was replaced with steel girders 36 ft. 6 in. long on concrete abutments resting on wooden pile foundations; bridge No. 103, as has been said, is to be replaced with two rows of 55-in. concrete pipe; bridge No. 105 consisted of two through plate girder spans approximately 55 ft. long, supported by two concrete abutments and a center pier carried on wooden piling, the abutments and pier of which were



Looking West from Bridge No. 103

extended on which to erect duplicate girder spans for the second track, and bridge No. 107, originally a 20-ft. concrete and I-beam span on concrete abutments almost wide enough for two tracks was widened approximately four feet on each side and thoroughly waterproofed. Other work involved the relocation of the station at Easton, and the construction of a new local freight track at Rittman.

New Track Is Placed in Service

The entire improvement between Warwick and Sterling was placed in service on July 30, including that portion of the new eastbound main track over the sink hole territory. Three weeks prior to this date it was desired by the operating department to run certain freight trains over the new second track and this was provided for by installing turnouts at either end of the sink hole territory and operating over the westbound track as a gauntlet over this section. The new fills over the sink holes have shown no signs of settlement since being placed in service and the track at these points has required less maintenance than that on some of the other portions of the new line. The old eastbound main track will be kept in service for a short time to permit the new roadbed to become thoroughly compacted and the new main track to be brought to line and surface periodically. It is planned to abandon operation over the old line during the fall at which time the new line will be placed in operation for both passenger and freight trains.

The entire work was handled under contract by the Vang Construction Company, Cumberland, Md., under the general supervision of H. A. Lane and A. C. Clarke, chief engineer and district engineer, respectively, of the Baltimore & Ohio, while G. F. Cunningham, assistant engineer, and H. P. Craig, field engineer, were in charge on the ground for the railroad company.

Indications Point to Adequate Supply of Ties

In Spite of Adverse Weather in Many Areas, Output Will Meet Increased Demands of Roads

IN SPITE of the fact that a number of the railways have found difficulty in recent weeks in securing ties for immediate delivery, the producers are confident of their ability to meet all demands during the year at the same or slightly higher prices. This conclusion was drawn from reports presented by district directors of the National Association of Railroad Tie Producers at the ninth annual convention of that organization which was held at Nashville, Tenn., on January 28-29.

In reviewing conditions in the North Central district Frank C. Parrett, general manager of the Baker Wood Preserving Company, Washington Court House, Ohio, reported a marked increase in demand during the last six months. Production in this territory during 1926 was low due to depressed prices in preceding years and unfavorable weather conditions late in 1925 and in 1926. Demands of carriers in producing territories also depleted stocks for shipment outside. Conditions in this territory indicate a moderate upward trend in prices. In New England there has been a marked substitution of native hardwoods for imported southern pine ties, due primarily to increased accessibility of new stands of timber by reason of improved highways.

Rainfall Delays Operations

In the Southeastern district weather conditions have been favorable for the production of ties until the last 60 or 90 days when excessive rainfall has delayed operations, according to W. W. Andrews, secretary and treasurer, Nashville Tie Company, Nashville, Tenn., and director of the Southeastern district. The labor supply has been normal but deficient in quality, tending to encourage saw mill production. Tie production in 1926 was slightly ahead of 1925 and about the same as in 1924. In recent months the demand has been heavier than for several years.

The production of ties in Wisconsin, Minnesota and the upper peninsula of Michigan is being curtailed seriously as a result of early and heavy snows before the ground froze, whereas production in the lower peninsula of Michigan has not been affected adversely by the weather, according to W. J. Foye, The Foye Lumber & Tie Company, Omaha, Neb., reporting for the North Central district. There are no stocks of ties on hand in this territory while prices are the same as last year.

In the South Central district the heavy rains have retarded tie production during the last 90 days, according to the report presented by John Fuhrer, Egyptian Tie & Timber Company, St. Louis, Mo., and director of the South Central district. The supply of lumber has also been short and the production of hewn ties is less in proportion to the total output than in the last three years. Production in most sections of this territory has been much less than in 1924 or 1925 because of the adverse weather and also because of the low prices and the light demand.

Production Less in Wyoming

Conditions in Wyoming were reported as fairly satisfactory by Otto Gramm, president, Fox Park Timber Company, Laramie, Wyo., director for the Rocky Mountain district, with prices the same as last year. Production in this territory is from 30 to 50 per cent below that for 1925 while stocks are below the average for the last three years. The demand is also light at present.

Conditions on the Pacific coast were reviewed by E. H. Meyer, vice-president and general manager of the Charles R. McCormick Lumber Company, Portland, Ore., and director of the Pacific Coast district, who reported that stocks of ties on hand in that territory are confined to limited accumulations of 6 in. by 8 in.—8 ft. and 7 in. by 8 in.—8 ft. No. 1 common, cut by small saw mills as a last resort when logs will make nothing else, this trend becoming more pronounced each year. The increasing use of larger ties has resulted in the production going from the so-called tie mills to larger plants. Purchases on the Pacific coast in 1926 were not as heavy as in 1925 as a number of roads in the central west have not gone to the coast for as many ties as formerly. There has, however, been an increasing demand for ties for shipment through the Panama canal to the Atlantic seaboard, although the export ties declined severely dur-

ing 1926. During the first nine months of 1926 tie prices held firm but during the last three months of the year they weakened from $1 to $2 per thousand feet board measure.

Producers Want Specifications for Small Ties

That the producers have accepted the standard specifications of the A. R. E. A. for ties was indicated by John T. Logan, president of the National Lumber & Creosoting Company, Texarkana, Tex., and president of the association, in his review of developments of the past year in which he states that "The general adoption of these specifications, viewed as fair and reasonable as far as they go, represent a forward step of vast importance to the tie industry as well as to the railroads. Already their effect is to eliminate much confusion. With few exceptions, neither producers nor consumers would return to the practices of the past. However, though these specifications as must be acknowledged, constitute the best work of the sort yet brought forth and serve largely to clarify the atmosphere and forestall many complications in trading with trunk line railroads to which roads they seem eminently satisfactory, they do not appear to entirely meet the producer's needs. They fail to provide appropriate and full classifications for ties less than 6 in. in thickness but more than 5 in. wide on top."

"This action might by proper action in large measure cure the serious objection described. There is a legitimate demand among light traffic lines for ties down to five inches in thickness and as such ties inevitably will continue to be manufactured, this association should be sufficiently resourceful to bring about the establishment in this industry and among consumers concerned of appropriate designations to cover sound ties less than six inches thick. In this connection ties carrying thicknesses of 5 in. and 5½ in. and widths ranging from 6 in. to 8 in. might logically receive consideration."

Mr. Logan also referred to "the question of providing ways and means for assembling, for equitable and legal dissemination, accurate information at appropriate intervals, covering the status of supply and demand of the products of the industry represented by this association." He suggested the creation of a statistical bureau that would keep all concerned informed of visible supply and demand.

Future Sources of Cross Tie Supply

No question is of more concern to cross tie producers and to the railways than the assurance of an adequate supply of timber to meet future requirements. For this reason a paper presented by E. A. Sterling, eastern manager of James D. Lacy & Company, New York City, was received with special interest, presenting as it does an optimistic viewpoint regarding the possibility of the depletion of our tie resources. Mr. Sterling spoke in part as follows:

Cross-ties have the advantage of being small standard units, easily transported and produced from small trees. They are essentially a low grade material. As the virgin forests are cut the remaining stand, if any, is low grade and of less volume. Ties may be produced in lots of from one to a million and since an individual worker can hew one tie out of one tree or a mill can saw thousands of ties where a few boards could be produced at a profit, the range and character of tie production are much broader than any other form of woods operations, save possibly acid wood or pulpwood.

These conditions make practically the entire forest region a tie producing territory with every wood lot owner or man with an axe and team a possible producer. As the highway systems are extended and improved, new sources of supply will be opened up and the still poorer timberlands worked over by the tie producer.

The cut-over lands of the larger lumber companies in both the hardwood and pine belts are a large potential source of cross-tie supply with regrowth and trees left from the original cutting contributing to this supply. In many cases these cut-over lands are being held intact so that whatever growth they carry is really a reserve for the future uses to which it is best adapted.

Viewed broadly, the entire mountain hardwood belt, extending down the Blue Ridge and Appalachian ranges and westward through Kentucky and Tennessee, is a cross-tie region. Millions of acres carry timber of little value for any other purpose. Some one has guessed that the two states of Kentucky and Tennessee alone have some 23,000,000 acres of forest land so even 25 ties per acre would give a total of 580,000,000. They are not all within present reach of transportation nor can the lighter and poorer stands be cut at a profit at today's prices.

In the swamp and bottom land forests along the Atlantic seaboard and in the lower Mississippi Valley the oaks and gums predominate and as in the mountains both the virgin and cut-over lands carry a large amount of timber suited primarily for cross-ties. These swamp hardwoods, especially in the Atlantic states, have been logged to only a limited extent but their value is now gradually becoming recognized and as they are opened up by logging operations a practically new source of hardwood ties becomes available.

The northern hardwood belt, stretching across the northern lake states eastward through Pennsylvania, New York and New England, came into recognition as a source of cross-tie supply when creosoting was adopted as a standard practice by the northern railroads. These treatable woods, made up largely of beech, birch and maple, have served to bring the cross-tie supply of several railroad systems back to or near their own lines.

The yellow pine belt, stretching for 1,200 miles down the coast from Norfolk to south central Florida and westward another thousand miles into Texas and well up into Arkansas, has been and will continue to be an accessible and important tie producing area. Heart longleaf and white oak ties were practically standard before creosoting became universal and continue to be produced, with loblolly and shortleaf coming into the market during the past 20 years. There is almost no end to the yellow pine tie material available and more than any other species, it is being replaced constantly and rapidly by regrowth.

With over 50 per cent of the remaining standing timber of the country, the Pacific Coast should be able to take care of itself for several years to come. Their problem, if there is one, is not in the availability of timber but in its production and distribution as ties but all of this is rather outside of the problems of those of us who live east of the Rocky mountains.

With enough ties in sight to provide for the diminishing requirements, resulting from preservative treatment, for more years than anyone is able to estimate and with the standing tie material within reach, supplemented by additional timber as transportation facilities expand and new regions become

exploitable there is no apparent ground for worry or alarm. The problems for the present are in operating, distribution and cost rather than supply.

For those who care to look still further ahead, there is comfort in the fact that still more ties will be created within a generation in the laboratory of nature. This means that the growth factor is a mighty potential source of supply in itself.

The conclusion which it seems safe to reach is that ties will continue to come for an indefinite period from the same source they have in the past and that there is no ground for anticipating a shortage.

Officers Elected

In the election of officers for the ensuing year A. R. Fathman of the Western Tie & Timber Company, St. Louis, Mo., was elected president of the association; S E. Ewing, of S. E. Ewing & Company, Nashville, Tenn., first vice-president; E. H. Meyer, of Charles R. McCormick & Company, Portland, Ore., second vice-president; E. A. Morse, of the Potosi Tie & Lumber Company, St. Louis, Mo., secretary; and C. D. Christian, of the Standard Tie & Lumber Company, Meridian, Miss., treasurer. Little Rock, Ark., was chosen as the location for the next convention, the date for which will be selected by the executive committee.

Reports Ascribe Accidents to Objectionable Practices

AMONG recent accident reports issued by the Bureau of Safety of the Interstate Commerce Commission is one reviewing the causes of three derailments occurring within a short period of time on a single division of one railroad, another covering an unusually gruesome motor car accident and a third covering a derailment occurring at night at a switch which was not equipped with lamps. In each case pertinent comments were made on the circumstances contributing to the accident and in the case of the three successive derailments the management of the railroad was severely censured.

Elimination of Switch Lamps Deemed Undesirable

The derailment of a passenger train on the Southern at Moy, S. C., on November 20, occurred at a facing point switch for a passing track equipped with a ground throw stand having a target that shows white when the switch is closed and red when it is open. The accident occurred at 10:05 p. m., and as the switches on this line are not equipped with lamps the enginemen are compelled to depend upon the aspect of the target to determine the position of the switch. The train was double headed and the engineman of the lead engine, who survived the accident, said that he did not see the indication of the switch target, as this particular target is difficult to observe because the approach is on a curve.

Inspection after the accident showed that the switch points were partly open and that the target showed partly red and partly white. The switch lever was latched (but not locked) in a position which lined up the switch for the passing track, and careful inspection of the switch led to the conclusion that the switch had been run through by a previous train. In its conclusions the Bureau of Safety absolved the section foreman from any responsibility for the accident, but laid particular emphasis on the fact that the use of switch lamps had been discontinued on this division of the railroad. While it cannot be definitely stated that the presence of a switch lamp would have prevented this accident, the bureau is of the opinion that "As a matter of ordinary safety, particularly where there is no automatic block signal system in use, it is believed that all main track switches should be equipped with switch lamps."

Collision of Motor Cars Kills Six Men

On the night of November 16 at 8:45 p. m. two motor cars on the Louisville & Nashville, each carrying track gangs of nine men, collided near Fountain Head, Tenn., with the result that six men were killed and all of the others were injured. The track at the point of the accident is on a tangent, and according to the testimony of a supervisor, it would have been possible for the operators of the motor cars to have observed each other for a distance of about 750 ft. if the cars had carried lights.

The occasion for the movement of these cars at night was to provide the necessary track men to clear up a train accident which had occurred in the territory some time previously, but for reasons not made entirely clear in the testimony, one of the motor cars was traveling away from the scene of the wreck instead of toward it. Testimony was also conflicting with respect to whether or not the cars were carrying lights as required under the rules, but it is reasonably certain that one of the cars had no lights burning at the time of the accident.

The report of the Bureau of Safety of the Interstate Commerce Commission holds both foremen at fault for the accident, one of them for operating his car at excessive speed and the other for moving his car in a direction contrary to that in which he was presumed to have been traveling. The report also contains the following observation with respect to the operation of motor cars on railroads:

"The increasing use of power-operated cars for the transportation of workmen in the various departments of a railroad, resulting in the transportation of large numbers of men at much higher rates of speed than formerly was the case with hand-operated cars, raises the question as to whether there should not be more stringent rules governing their operation. It might be impracticable to handle all of such movements by train-order authority, and undoubtedly a section foreman in general should have the right to move where he pleases on his own section so far as opposing motor cars are concerned. But when an emergency arises which requires section men to leave their own particular section and proceed to some other section, perhaps 40 or 50 miles distant, then it is a question whether movements over such other sections should be made only by train-order authority. Accidents of the type covered by this investigation are not of frequent occurrence, but the seriousness of this particular accident fully warrants such steps as can be taken to prevent the occurrence of other accidents of a similar nature."

Three Fatal Derailments in 28 Miles in 13 Months Time

That bad track conditions on the Atlanta, Birmingham & Atlantic were responsible for three derailments resulting in the death of five employees and the injury of others on the same division within a distance of 28 miles and within a period of 13 months, is the conclusion of the Bureau of Safety of the Inter-

state Commerce Commission in a report covering the latest of these accidents which occurred near Deerhurst, Ala., on October 27.

The train derailed at Deerhurst was a freight train consisting of an engine, 27 cars and a caboose, traveling at about 25 miles per hour on the main track which was laid with 80-lb. rails 33 ft. in length with from 18 to 25 ties per panel on slag ballast. The ties are not tie-plated.

Examination of the track after the accident showed that the wheels on one side of the equipment, were derailed by dropping down between the rails, the rails being bent outward and the outside flanges of the rails cutting deep indentations into the ties, while some of the spike heads were broken off on the inside of the rails. "One of the rails was pushed outward to the extent of 1⅛ in.," the report continues, "while as many as four spikes had been used in some of the ties to hold the gage. Only a few sound ties were in the track at this point. They were in all stages of decay and some had reached the point where the spikes could be lifted by hand, while many of the ties were rail-cut to a depth of from one to three inches and some were broken under the rail. At many of the joints the spike heads had been pushed out more than ½ in. from the rail, permitting the gage to open when a train passes over it."

The conclusion of the report definitely ascribes the accident to bad track conditions. In commenting on the roadmaster's statement that he considered the track safe for speeds of 20 to 25 miles per hour, attention is called to the fact that passenger trains are permitted to attain a speed of 40 miles an hour. It was recommended that the speed of trains be restricted to a safe rate until the track is placed in condition for the operation of trains at the higher rates of speed. "When attention has been called to such a matter by the occurrence of a serious accident," states the report, "it would seem that this ought to be sufficient to cause the situation to be remedied. That such is not the case, however, is evidenced by the fact that this is the third derailment in this particular territory." The report then quotes from the report of the first of these accidents which occurred at Parkwood, Ala.

"The evidence indicated that there were not enough section men to maintain the track properly, and that about all that could be done with the force available was to make repairs to the worst places and then do the best they could with the rest of the track. Such a situation is not conducive to the safe movement of trains, and measures toward eliminating this condition should be taken as quickly as possible."

Are Bridge Builders Progressive? What One of Them Thinks

By PHILIP GEORGE LANG, JR.
Engineer of Bridges, Baltimore & Ohio, Baltimore, Md.

THE QUESTION has recently been raised, and some discussion has occurred as to whether bridge building work has kept pace with other railroad activities in the use of mechanical appliances. In other words, doubt has been expressed as to whether maximum use has been made of labor-saving devices in such operations, with a view to reducing actual labor costs, apparently implying that bridge building activities have not been conducted economically.

Before proceeding to a discussion of these matters, it seems advisable to distinguish clearly between two widely different classes of bridge work, which are utterly dissimilar, so far as the materials and equipment used are concerned, that is, timber trestles, whether so-called framed or pile, and steel or iron bridges. It seems well, likewise, for the purposes of this discussion, to eliminate questions concerning concrete and masonry structures, although there would seem to be no disagreement in regard to the labor-saving devices which have been introduced in connection with structures of the latter classes. Within the past 20 years the use of stone masonry has practically ceased, and in fact it is at present almost impossible to obtain experienced and competent stone cutters and stone masons. This condition is largely due to the development and use of labor-saving equipment in connection with concrete, the rapidity with which the concrete can be placed, and the possibility of molding this material to meet local requirements. Further, such labor as is employed in concrete work is less skilled than in the case of stone masonry. It would seem, therefore, that in the construction of masonry bridges, the maximum advantage has been taken of labor-saving devices, and this fact seems evidenced beyond doubt by the disappearance of stone masonry.

In regard to the two main classes of bridges under discussion, consideration will first be given to timber structures. Such structures are rarely like the "one-horse shay," that is, they do not fall all to pieces at one time, but their nature is such that it becomes necessary, from time to time, to repair and replace them in part, while at the same time keeping traffic moving.

There is little opportunity for using labor-saving devices in this work, although the last 20 years has witnessed the introduction of air tools for drilling, sizing and framing timber. The use of treated timber has been common and this has necessitated the pre-framing of the timber according to plan at large central plants prior to its treatment. Certainly this is a step toward labor saving and economy.

It would further seem that there is no question but that a vast improvement has been made in the type of pile driver used. The ordinary pile drivers of today are self-propelling, capable of driving piles ahead of themselves or on either side. Such efficient and labor-saving devices were not in use 20 years ago. In fact, it would appear that in some cases trestle builders are constantly on the lookout for labor-saving devices, as frame trestles have been built of material hauled to the site in a Ford truck, the timbers afterwards being handled and placed by means of suitable blocks with wire rope cable being

attached to the truck, which furnishes practically all of the labor on the job. "Flivvers" were neither cheap nor plentiful some years ago.

In regard to the second class of bridges, that is, iron and steel structures, it would seem that the advance in labor-saving devices has been very extensive. Consideration of the actual methods of erecting bridges will serve as an indication. In the early part of the present century it was the common practice to place bridges on falsework by the use of stiff-leg guy derricks, gin poles, gallows frames and heavy, cumbersome travelers. Today such improvised devices are rarely seen, and it is doubtful whether the rising generation of bridge builders has other than a historical knowledge of such things. Derrick cars and heavy locomotive cranes capable of handling as much as 150 tons have been developed.

The pin-connected truss has become obsolete, largely due to the development of labor-saving devices. When rivets were driven by hand, a riveted structure was expensive. When the gasoline engine was developed and readily portable power thus made available, compressors and air tools quickly followed. Air hammers, air buckers-up, pneumatic rivet busters, air drills, and finally the air spray for painting came into use, and, as an ultimate development of pneumatic power, or, if we may use the expression, the "last word" in the use of air on large jobs in the field, rivets have been heated at a convenient central location and transported by air through tubes to the point where riveting gangs were at work, in the familiar manner of cash carriers in department stores.

One must not lose sight of the fact that railroad traffic has increased at a greater rate than the fixed facilities for handling it; notwithstanding this fact, bridges today are built and rebuilt with the minimum and, in fact, with almost no interference with traffic. It is doubtful whether the old methods could be followed under modern conditions without serious interruption to traffic. This development is due solely to the use of labor-saving devices.

Many Special Operations No Longer Novel

Twenty years ago large rolling and jacking operations were sufficiently uncommon to be considered quite novel; today they are almost the accepted practice. There has been an advance in the design of jacks, and batteries of power-driven jacks have been used. Large and complicated rolling and jacking operations have been controlled in the field from a central point by means of telephones.

In any discussion of economies, it would also seem necessary to keep in mind the relative costs. In other words, is the question one of costs today compared with costs at an earlier period? If so, what shall the measuring stick be? The value of the dollar is neither fixed nor permanent, and the trend of all costs is upward. This, however, would seem to be necessarily the case, since man has the habit of accumulation, and the things which are accumulated require attention for maintenance and repairs. A stone structure built 100 years ago cost approximately $5.25 per cu. yd. Certainly, under no conditions can such costs be met today. If, however, the question is solely one of saving labor, with the idea of releasing labor for higher forms of work, to permit its employment in producing so-called "luxuries" rather than necessities for a bare living and in adding to the total accumulation of things by which wealth is measured, then it would seem that trestle and bridge building and rebuilding have, so far as the present state of the mechanical arts is concerned, kept pace with the times and other activities.

Bridges Are Rebuilt Today With a Minimum of Interference With Traffic*

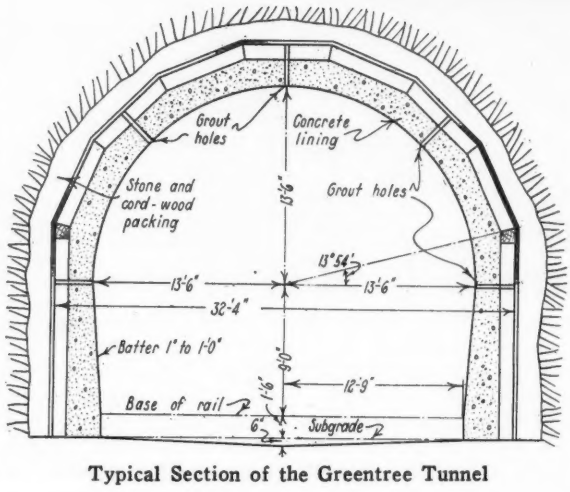
* Old Bollman spans on Valley Railroad of Virginia (Baltimore & Ohio), built in 1872-73, replaced in 1923.

Make Use of Grout and Gunite In Repair of Tunnel Lining

Pittsburgh & West Virginia Applies Concrete Mortar with Marked Success and Economy on 700 ft. of Greentree Tunnel

Applying Gunite from a Platform on a Car

WITH 3.88 miles of tunnels on the 89-mile line of the Pittsburgh & West Virginia, one of the chief concerns of that road is the maintenance of its tunnels in the most economical manner, consistent with permanence and safety. While this problem has not been particularly severe, and has always been handled with little difficulty in the past, disintegration of a somewhat unusual nature developing in certain parts of the concrete lining of that road's Greentree tunnel led to considerable study of the causes of the disintegration and the best and most economical method of making repairs. This study resulted in the adoption of a method of repair not previously used on that road, which consisted principally of a complete grouting of the tunnel packing and all cracks, and the relining of the entire invert with gunite through a length of 700 ft.



Typical Section of the Greentree Tunnel

Tunnel Completed in 1903

Greentree tunnel is a 4,716-ft. double-track bore, located about five miles south of Pittsburgh on the main line of the P. & W. V. between Pittsburgh and Pittsburgh Junction, Ohio. This tunnel was completed in 1903, in connection with the construction of a link in the projected Wabash transcontinental system. In driving the tunnel a wide variety of material and considerable water were encountered, which made it advisable, shortly after completion, to line the entire tunnel with from 24 to 30 in. of concrete. This work was done in 1908-1909, all of the concrete being placed pneumatically. In the space between the outside forms and the rough cut face of the tunnel, stone and cord wood were used for packing to distribute any load which might come on the arch lining, the amount of these materials used averaging about two cubic yards per lineal foot.

For the most part the concrete lining of the Greentree tunnel has stood up well, and yet, only a few years after it was put in place, disintegration was in evidence at some points, particularly at wet spots near the portals. For some time this did not appear serious and little was done in the way of making repairs other than to put in brick patchwork at a number of points. As time passed, however, disintegration appeared to develop rapidly, two large cracks occurring at the crown and springing lines. By 1925, in spite of the repairs made, these cracks became so large, ranging from about 50 ft. to 300 ft. in length, and in some places up to ¼ in. wide, that it was obvious that major repair operations were necessary.

Conditions Leading to Disintegration of the Concrete Lining Were of Complex Origin

The principal causes for the disintegration of the concrete lining were apparently three in number—porous concrete, the infiltration of sulphurous water, which in the presence of air set up a destructive chemical action, and the mechanical and chemical effect of the blast of locomotives. The first and last mentioned of these three destructive agencies were

Gunite Crew at Work. The Repair Forces Were Given the Full Use of One Track at a Time During the Working Period

readily understandable, but the second, while known actually to be a cause, has not yet been analyzed to the point that affords a scientific understanding of the exact chemical reactions that take place between the sulphur-laden seepage water and the concrete in the presence of free air. That air is essential to the disintegrating reaction is evidenced by the fact that the disintegration in every case extended from the inner face of the lining outward, the deteriorated sections ranging from two to eight inches deep. Back of these portions the concrete, although saturated with the same character of water, was practically as sound as the concrete in the dry portions of the lining in other parts of the tunnel.

Water Drained from Coal Strata

The source of the sulphurous water is the workings of old coal mines which overlie the tunnel, and the general underground flow which acquires its sulphur content as it passes through the coal strata. Seeping into the concrete where porous, this water set up disintegration wherever it came in contact with the air.

To remedy this situation permanently, it was obviously necessary to drain away the water more effectively from around the lining so as to preclude building up a head of water, to waterproof the lining to prevent seepage of that water coming in contact with the lining, and then to repair the inner face of the lining. At the extreme west 700 ft. of the tunnel where the conditions were most severe, all of these remedial measures were taken, the methods resorted to being based largely upon the particular conditions existing and the desire to carry out the work in the most economical manner.

The methods employed consisted of installing vertical side drains in the tunnel lining where such were deemed advisable, solidifying the tunnel packing by forcing a rich grout through holes in the concrete lining, and then cleaning out the disintegrated concrete in the lining and guniting on a new surface over reinforcing mesh. The latter method of repairing the lining was decided upon after full consideration was given to making the repairs by means of a three-ring brick arch extending between springing lines, this method being abandoned because of the excessive chipping of the old lining that would have been required in order to install the brick arch so as not to interfere with clearances, and also because of the largely increased cost of this method over guniting.

In repairing the tunnel, the first problem was to provide additional drainage. Where the most serious wet spots in the lining occurred, therefore, vertical tile drains were installed in the battered bench walls, this being accomplished by cutting out a section of the wall, extending the tile up into the packing, and connecting the lower end with the main tunnel drain which is located at the center line of the tunnel throughout its length.

With the drains installed, grouting of the packing and the cracks was undertaken. In doing this work all of the grout was placed pneumatically under about 90 lb. pressure, supplied by air compressors set up outside the west portal. In order to insure the complete grouting of the packing, the grout was forced through the tunnel lining at about 20-ft. intervals throughout the length to be repaired, five grout holes being drilled at each station. Two of these holes were at the springing lines on either side of the lining, while the other three holes were drilled at the quarter points of the soffit and at the top.

Grout Bench Walls First

The first grout was placed behind the bench walls of the lining through the holes at the springing lines, the material being forced into the packing up to the level of the holes. The packing behind the first quarter of the arch ring on either side was then forced full of grout through the second set of holes in a similar manner, and with this completed the top portion of the packing was grouted solid, the grout being forced to refusal through the hole in the crown of the lining.

The grout used consisted of one part of cement and two parts of sand, this mixture being made thin enough to permit its flowing under pressure into all of the cracks and crevices of the packing and the lining. That this was accomplished is evidenced by the fact that while placing the grout, squeeze-outs occurred through the cracked lining, in some instances as far as 400 ft. from where the grout was being forced in. Wherever this occurred the flow was stopped by calking and the grouting resumed.

The grouting crew, which started work on April 28, was followed closely by a force which chipped off all of the disintegrated concrete in the lining, both on the arch ring and the bench walls, until sound concrete was exposed. The depth of the chipping ranged from about two inches to a maximum of about eight inches in some places. When this had been completed for some distance, expansion bolts were driven into the lining, about 24 in. center to center, to which mesh reinforcing was fastened. In the latter part of the work, common cut track spikes were used in place of the expansion bolts, it having been found that when these were driven into drilled holes of somewhat smaller diameter than the largest cross sectional dimension of the spikes, their holding power was more than that of the bolts.

Use Welded Wire Mesh

The reinforcing used was a single layer of electric welded square mesh, made up of No. 8 gage galvanized wire, the wires being spaced six inches center to center. This was attached to the bolts or spikes by galvanized wire, care being taken that the mesh was so placed that it would not be closer than one inch from the finished surface of the new gunite facing.

The gunite work was begun on July 1, the preliminary work having advanced sufficiently by that time to preclude the interference of operations. Immediately preceding this work, with the reinforcing in place, the surface to be built up was cleaned further by a sand blast and then wetted down to receive the gunite. In applying the gunite, the entire inner surface of the tunnel lining, throughout the length repaired, was covered to a thickness ranging from a minimum of two inches to a maximum of about eight inches, depending upon the amount of old concrete removed. Where the new surface was over two or three inches thick, the gunite was applied in two or more coats, it having been found that this was necessary in order to secure the best results.

Little Special Equipment Was Required

The principal equipment used in connection with the repair of the tunnel consisted of two air compressors with a total displacement of 900 cu. ft., two grout guns, one cement gun and a sand blast gun. Other equipment used in the work included air drills and air-operated cutting and chipping hammers. Possibly the most interesting items of this equipment were the grout guns used, which consisted simply of a cylindrical metal container or drum equipped with an air line and a water line connection, and an outlet to the grout line and nozzle, each of these connecting lines being equipped with a suitable valve. The only other important part of the unit was a hinged cover which opened inwardly within the container, for charging it with sand and cement, and sealing it while it was delivering its charge to the nozzle.

In operating this equipment, a predetermined amount of water was allowed to enter the drum and then, while air was permitted to boil through the water violently, the charge of cement and sand was added. When the grout had become thoroughly mixed by the action of the air passing through it, the cover of the drum was closed and the grout valve opened, which permitted the grout to be forced out to the nozzle.

In carrying out the work within the tunnel, the repair forces were given full use of one track at a time, which permitted the work to proceed without interruption except when the smoke from locomotives made this impossible for a few minutes after the passage of trains. In reaching the work, the grout guns were mounted on elevated platforms built upon push cars, while the chipping and cleaning work, the affixing of the reinforcing, and the guniting, which was out of reach from the floor of the tunnel, were handled from staging built on two gondolas, this staging including a broad platform and a high apron on the side toward the live track to protect the workmen and to preclude any possible danger to trains using the tunnel while the work was in progress.

Expect Repair Work to Be Permanent

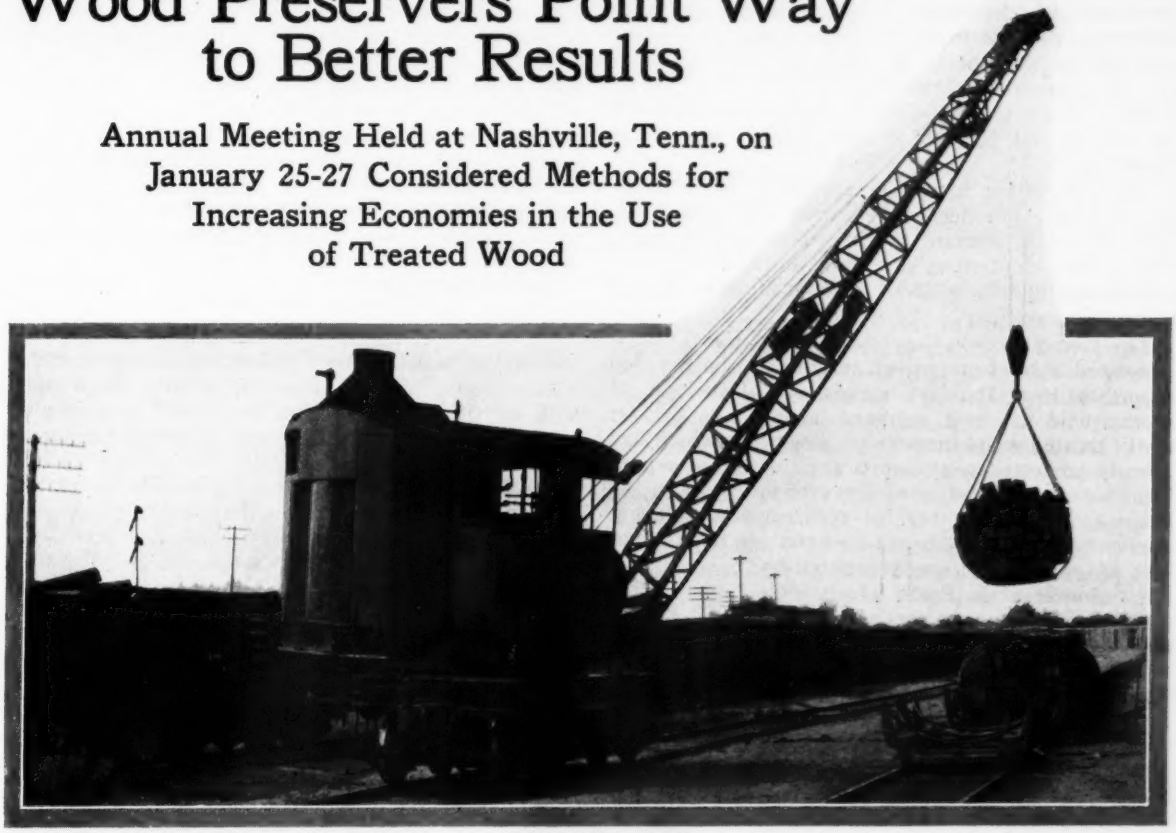
The repair work within the tunnel was completed on December 1, 1926, and while the ultimate effectiveness of the methods employed cannot be determined yet, tests and examination of the work show that a perfect bond was secured throughout between the gunite and the old concrete lining, that the drainage installed and the solidifying of the packing has stopped all seepage, and that the gunite facing is a dense hard surface which should successfully resist frost action and the blast of locomotives. That the Pittsburgh & West Virginia is favorably impressed with the work is evidenced by the fact that it is now repairing a section of its Atchison tunnel by the same methods, the only variation being that the solidifying of the packing is being carried up only to the springing lines on either side of the tunnel arch rather than over the full section.

The repair work within the Greentree tunnel, which cost only approximately one-half of the estimated cost of repairing the tunnel with a three-ring brick arch, was done by company and contract forces, the grouting and cleaning being handled by maintenance department forces while the gunite work was done by the Fritz-Rumer-Cooke Company, Columbus, Ohio. The work was done under the direct supervision of H. H. Temple, chief engineer, to whom we are indebted for the information presented above.

Southern Pacific Changes Lake Tahoe Line from Narrow Gage to Broad Gage.

Wood Preservers Point Way to Better Results

Annual Meeting Held at Nashville, Tenn., on January 25-27 Considered Methods for Increasing Economies in the Use of Treated Wood



WITH THE growing recognition of the advantages of treating railway ties and bridge timbers, the American Wood Preservers' Association is finding less occasion for devoting attention to demonstrations of the economy of using treated timber in this field. Instead, it is devoting more attention to the highly technical problems of effecting improvements in the use of preservatives and in plant practices that will make for greater economy in treatment and better service results. This was evident in the discussions at the twenty-third annual meeting of the association, held at the Hermitage hotel, Nashville, Tenn., on January 25-27.

As in past years a report on service tests of crossties was a feature of the program but, in the main, the sessions were occupied with discussions of specifications of preservatives and treatment methods as well as theoretical aspects of protecting wood from decay. The review of European practices by George M. Hunt of the United States Forest Products Laboratory, Madison, Wis., abstracted in following pages, gives an insight into the methods prevailing in Europe which have been responsible for pronounced economies in the use of wood there, although it would seem that few of the detailed methods are applicable to American conditions. The various papers and committee reports presented at the convention are reviewed in brief in the following pages.

The various sessions of the convention were presided over by President C. F. Ford, supervisor of ties and timber, Chicago, Rock Island & Pacific. The attendance was approximately 300. At the annual election held during the last session of the meeting the following officers were chosen to direct the affairs of the association for the coming year: President, O. C. Steinmayer, superintendent timber preservation, Canada Creosoting Company, Montreal, Que.; first vice-president, H. R. Condon, forester, Pennsylvania System, Philadelphia, Pa.; second vice-president, H. E. Horrocks, manager, Pacific Creosoting Company, Seattle, Wash.; secretary-treasurer, E. J. Stocking, Chicago; members executive committee: C. C. Cook, maintenance engineer, Baltimore & Ohio, Baltimore, Md.; William Steen, manager, Long Bell Lumber Company, Shreveport, La.

Discuss Technical Problems

THAT there is room for improvement in plant practices with respect to the separation of crossties into various sizes and groups required for treatment is apparent from the study made by the Committee on Material Handling. One reason ascribed for this condition is the failure of some of the railroads to conform to the standard specifications for cross-ties, some railroads requiring no separation and others as many as 12 separations. In the opinion of the committee, ties should be separated as to sizes and groups before shipment to the plant and that the inspection be made at the point of loading, so that the ties can be stacked properly as unloaded. The committee recommended further study of this problem and a study and report on accidents at treating plants.

Specifications for the treatment of poles were submitted by the committee assigned to this subject, these specifications embracing treatment by the nonpressure process, both with and without incising, and a short-time immersion treatment. The first two

forms of treatment are favored by the committee as productive of substantial results. However, the committee pointed out that inasmuch as many are using the less desirable form of treatment because of an unwillingness to pay the price of something better, it is advisable to provide a specification which will insure the best possible result with the immersion treatment.

The Committee on the Treatment of Fir Lumber reported that practices were as yet not sufficiently well defined to warrant the presentation of a specification for adoption at this time, and recommended a continuation of the study by a committee during the coming year.

The Committee on the Treatment of Car Lumber presented a brief statement amplifying the detailed report made at the last convention. Development in this field has been confined largely to a greater use of treated wood in cars by those roads which had already undertaken this practice. Lack of equipment for the application of pressure processes in the treatment of car timber for repair work makes it necessary to resort to brush treatment in most cases.

A progress report was submitted by the Committee on Posts which indicated that the committee had experienced difficulty in obtaining information with respect to some of the subjects assigned to it. The committee recommended a continuation of the work into 1927.

Special Treatment for Trunking

The Committee on the Treatment of Trunking and Capping presented specifications for adoption and inclusion in the Manual of Recommended Practice. In offering this specification, the committee pointed to a number of pertinent considerations which have a bearing on the treatment of wood which comes in close contact with insulated wire. These are in brief as follows:

"Dryness after treatment is the outstanding essential, coupled with thorough penetration, so that there is insured freedom from failure of signals by injurious effects of unabsorbed preservatives on insulation and wires. To obtain these results sapwood must predominate in the lumber used. Since only distillate creosote can insure such a dry, non-bleeding surface, the use of solutions, blends, or mixtures is inadvisable. As further insurance of a dry surface, devoid of unabsorbed preservative, it has been found advantageous to follow the final vacuum by a steam bath which not only washes the surface of the wood but makes unnecessary the former custom of storing trunking and capping for long periods after treatment before placing it in service."

C. F. Ford
President, American Wood-Preservers' Association

Study Steam Treatment

The Committee on Steam Treatment reported on tests made at the United States Forest Products Laboratory and the Forest Products Laboratory of Canada, on the effect of steaming in reducing the moisture content of wood. Those made in the United States were for the purpose of determining the relative advantages of a period of continuous steaming followed by a final vacuum as compared with a treatment in which the steaming is alternated with a vacuum drawing from two to four times. The conclusions reached are as follows:

"The alternate steam and vacuum seasoning was apparently much more effective in reducing the moisture content in comparison with a continuous steaming and final vacuum of the same total duration.

"The amount of moisture removed during steam seasoning was greatest in specimens having the highest initial moisture content. Very little or no reduction in moisture was accomplished by additional steam treatment of specimens in which the moisture content was as low as 30 to 40 per cent."

When Is Rot Not Rot?

W. H. Long, forest pathologist, Bureau of Plant Industry, United States Department of Agriculture, Albuquerque, N. M., presented a progress report with the title, "When is Rot Not Rot?" as a supplement to the paper he presented before the association at the convention in 1925. Dr. Longs' earlier paper represented the report of tests made on treated ties which had been subjected to heart rot in the Arizona and New Mexico ties which had been subjected to heart rot in the growing tree before having been cut, for the purpose of determining whether the treatment was effective in killing the fungus so that the rot could not continue in the treated tie. On the basis of his tests, Dr. Long made a plea for a more liberal attitude of purchasers with respect to the acceptance of ties containing heart rot of this character. In the second paper presented at this convention, he offered further tests to show that the ties are sterilized in the majority of cases; in fact, in all species of conifers tested except "floaters" in which, presumably because of the large amount of water absorbed, the treatment was not as thorough as in the other ties. These experiments do not, however, deal with rot resulting from attack by fungi subsequent to the making of the tie.

A plea for the consolidation of 40 to 50 per cent of the present capacity of the commercial treating plants as a means of effecting economy in the preservation of timber was made by H. S. Sackett, consulting timber engineer, Chicago. After citing the loss that results from preventable decay and the opportunity for the expansion of the wood preserving industry in the treatment of this timber, Mr. Sackett emphasized the economies that would result from concentration of supervision, centralization of plants, elimination of obsolete equipment and savings in marketing and distribution.

The report of the Committee on Preservatives consisted largely of statements of progress on certain technical studies, among which is one for a table showing the corrections to be made in standard sea level temperatures in the distillation of creosote when carrying out such distillations at various altitudes. The committee was unable to cite any definite development during the past year in the field of oils or other toxics designed to take the place of preservatives now in use. Studies along this line reported in a paper by E. Bateman and R. Baechler, chemists in the United States Forest Products Laboratory, show that many of the salts investigated are too

expensive or corrosive to be of value for pressure treatment.

In addition to the papers by Messrs. Bateman and Baechler there were two others dealing with the technique and theory of timber preservation. Mr. Bateman presented a paper entering into the causes for the eventual decay of treated timber and pointed to the opportunities for further investigation of the factors governing the permanence of treatment, such as the influences determining the rate of leaching. J. D. MacLean, engineer in forest products, United States Forest Products Laboratory, Madison, Wis., presented a paper dealing with the effect of temperature and pressure on the penetration and absorption of coal tar creosote into wood, based on investigations undertaken for the purpose of effecting improvements in treating plant practice.

The L. & N.'s Experience with Timber Preservation

W. H. COURTENAY, chief engineer of the Louisville & Nashville, spoke at some length on the experience of that road with the treatment of bridge and other timbers during the last half century. Mr. Courtenay's remarks are abstracted in part as follows:

O. C. Steinmayer
President-elect, American Wood-Preservers' Association

It is probable that the Louisville & Nashville has used creosoted piles and lumber extensively for a longer time than any other railroad, although I believe that it was not the first to use them. The New Orleans, Mobile & Chattanooga railway built a line along the Gulf coast between Mobile and New Orleans about 1870. That road crossed two wide bays of salt water, Bay St. Louis and Bay of Biloxi, also the delta of the Pascagoula river with a long bridge and trestle and the Rigolets, Chestnut and other waters in that southern country. Two years after the line was put in operation, teredo destroyed the trestle over the Bay of Biloxi and let a passenger train in. After that the road built a creosoting plant at West Pascagoula, Miss., now called Gautier, and operated that plant for many years.

The oil used was a waste product called dead oil of coal tar and was imported from London. I have seen many barrels of that oil in which the napthalene crystals would stand out three or four inches above the surface of the oil like feathers. So far as I know there was no test by distillation of the oil obtained at that time.

Good Results from Creosoting in Early Years

We got remarkable life from both the sawed lumber and piles which were creosoted in 1875, 1876 and 1877. I have cut 8 in. by 16 in. stringers which had been in service for more than 30 years and, so far as I could ascertain, it is doubtful if the creosote oil penetrated those stringers to a greater depth than ¼ inch. By cutting off chips from the corners of these stringers and chewing them, I could hardly taste creosote oil. The color of the stringers was a rather pale gray with no outside indication that they were treated.

These stringers, however, were the finest long leaf yellow pine that I have ever seen. At the time the road was built there were unlimited virgin forests of yellow pine and naturally the builders of the road selected the pick of it. All of those stringers were very close grained and very hard. The piles that were driven in the larger structures, such as at Rigolets, were 100 ft. long and were more than 24 in. in diameter at the large end. They were so large, in fact, that they had to be hewn in octagonal form to get them in the leads of the pile driver. The tops of the piles were cut down to the heart wood, the edges of course being sap.

Does Wood Eventually Become Immune to Decay?

Judging from my experience in looking at creosoted material which had been treated for many years, I suggested the supposition that after yellow pine is protected from fungus for a given length of time, it may possibly become immune. I saw no other reason for the extremely long life of this material. It is well established that green long leaf yellow pine placed in the moist atmosphere of the Gulf coast will last a short time.

In 1884 the trestle approach to the Henderson bridge across the Ohio river was constructed in part of creosoted piles. About 33 years after that trestle was constructed, I made an inspection of those piles by walking along the ground and looking at the piles at the ground and a short distance above, where the decay is apt to be the worst. A small proportion of those piles had decayed. The trestle was later reconstructed for the reason that we wanted to use heavier engines than were permissible over the original trestle.

About two years ago we completed the reconstruction of the Rigolets bridge across the pass between Lake Ponchartrain and Lake Borgne, about 31 miles from New Orleans. After the completion of the new bridge, which was placed on a different location from the old, we took down the old bridge. The old piles were extremely difficult to pull; in fact, it was impracticable to pull them out in spite of the fact that we had very powerful rigging. We broke heavy chains and heavy wire slings and finally had to break the piles off at the bottom by pulling them over. I examined a large number of these piles and found that down near the bottom the outside of the piles seemed to be reeking with creosote oil, while up at the top no creosote oil whatever was observable.

After cleaning the sea grass off of these piles, I examined many of them minutely and they apparently were as sound as a dollar. Many of these piles were afterwards used in other work.

We have had similar experiences with piles in other locations, but those which have been creosoted in the last 25 or 30 years have not given as long life as the piles and the lumber treated in the seventies. The only reason that I can offer is the quality of the creosote oil.

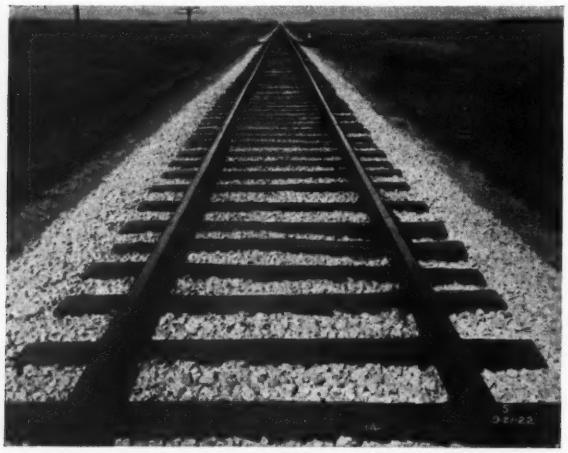
Is Some Oil Better than Others?

The question is how to determine whether one oil is better than another. Undoubtedly the results secured from creosote oil produced in the United States have not proved as good as those obtained many years ago from the oil from London. We have had

piles which decayed to such an extent that they had to be taken out in 10 years after being creosoted. We have had other creosoted timber that has lasted over 40 years, but the creosoted timber which has lasted over 40 years was in culverts on the New Orleans division of the road, the tops of which were covered with sand and the sand protected the creosoted wood from the direct rays of the sun which appears to draw the creosote oil out.

Some years ago it seemed to be the consensus of opinion that it is desirable to have a good deal of sap wood on timber to be creosoted. I do not concur in that view; my opinion is based on experience with dense, hard, close-grained yellow pine which had no sap whatever on it.

There was also an idea that if piles or other timber checked badly the wood would rot where not penetrated with creosote oil. We had some high trestles in southern Alabama with bad checks in the piles



Creosoted Southern Pine Ties on the Sante Fe's Hutchinson-Kinsley Cut-off

near the top. These checks were often more than ¼ in. wide and some of them reached at least 4 in. in from the outside of the pile. In order to determine whether there was any decay in these checks, I had core borings made and found that the wood was thoroughly sound.

Creosote Does Not Stop Teredo

The primary purpose in creosoting timber and piles on the original lines of the Louisville & Nashville was to protect them from teredo. Our experience is very extensive and we have found that creosoting will not protect them. We had a trestle 2¼ miles in length over Escambia Bay in Florida in which the piles were driven in 1882. The first inspection that I made of those piles was a surface inspection at about low water, when the north winds were blowing the water down the bay. I then discovered a few attacks of teredo. In later years many of these piles had to be protected. Likewise the wharfs in Pensacola Bay, of which there were three, were supported on creosoted piles, and the teredo attacked them very badly. These piles were protected by diffferent methods. The first method used was to make a wooden form in two halves, bolt it together and put rich Portland cement between the piles and the forms. Later we made a very rich concrete instead of mortar. After that we used a great deal of vitrified pipe, filling the space between the piles and the pipe with sand and covering the top with pitch. Still later, we used cast iron cylinders, cast in halves and bolted together.

Tie Service Records

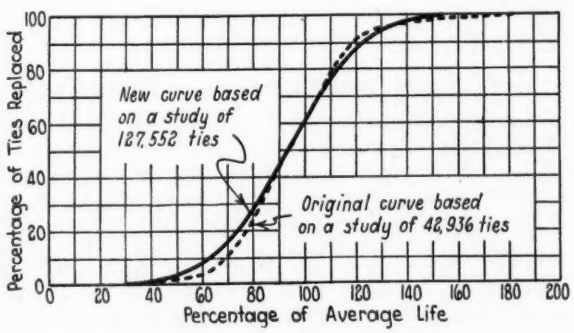
IN ADDITION to tabular reports of special test tracks on the Atchison, Topeka & Santa Fe, the Baltimore & Ohio and a number of other roads, the Committee on Tie Service Records presented the usual table of average tie renewals per mile of track on a number of railroads, the total this year being 26. The average renewals per mile of track in 1925 for the 26 railroads included in the summary, was 187, as compared with 268 in 1915. An appended column of five-year averages shows a gradual reduction from an average figure of 261 for the five years ending in 1915 to 194 for the five years ending in 1925.

Tabular Statement Taken from Tie Renewal Curve

Percentage renewed	Percentage of average life	Percentage renewed	Percentage of average life	Percentage renewed	Percentage of average life
1	39	36	85	71	107
2	45	37	86	72	107
3	49	38	87	73	108
4	53	39	87	74	109
5	55	40	88	75	109
6	57	41	88	76	110
7	59	42	89	77	111
8	61	43	90	78	112
9	63	44	91	79	113
10	64	45	91	80	113
11	65	46	92	81	114
12	66	47	92	82	115
13	68	48	93	83	116
14	69	49	93	84	117
15	70	50	94	85	118
16	71	51	94	86	119
17	72	52	95	87	120
18	73	53	96	88	121
19	74	54	96	89	123
20	74	55	97	90	124
21	75	56	97	91	125
22	76	57	98	92	126
23	77	58	99	93	128
24	77	59	99	94	130
25	78	60	100	95	132
26	79	61	101	96	135
27	80	62	101	97	138
28	80	63	102	98	142
29	81	64	102	99	148
30	82	65	103	100	188
31	82	66	103		
32	83	67	104		
33	83	68	105		
34	84	69	105		
35	85	70	106		

Estimate of average life should not be based on less than 20% renewals.

Another feature of the report of this committee



Comparison of the New and Old Curves for Average Life of Ties

was the presentation of a new curve showing the relation of the percentage of ties replaced to the percentage of average life to supersede the original curve presented by Mabel Thorne at the convention in 1918. The original curve was based on records of the life of 42,936 ties, whereas the revised curve is based on the records of 127,552 ties. A chart showing the relation between the original and revised curve and a tabular equivalent of the revised curve, are presented herewith.

Wood Preservation and Utilization in Europe

By Geo. M. Hunt

In charge of Wood Preservation, U. S. Forest Products Laboratory, Madison, Wis.

IN GENERAL, European ways of handling and using wood are not our ways, because differences between economic conditions there and here require differences in wood utilizing practices. Most of the countries visited do not produce enough wood for themselves and must import it. It is therefore not a material that may be thoughtlessly wasted. Similarly, although creosote is a surplus product in Europe, it is generally used more sparingly than in the United States, where most of it must be imported and its cost is higher. On the other hand, Europeans are quite often as wasteful of labor as we are of materials. In each case it is the cheaper commodity which is wasted, but in the final analysis both practices are inefficient.

Preservatives Used

Coal tar creosote is looked upon every where as the most effective preservative. Other preservatives are used oftentimes because of cost considerations or special requirements not met by creosote, but not because they are considered more effective in preventing decay. Under normal conditions a surplus of creosote is produced in England, Belgium, and Germany, a large part of which is shipped to the United States since we produce only about one-third of our needs. There is no assurance of a permanent surplus, however, because no one can foresee the developments of the next few years in the coal distilling industry. Even now there are occurring occasional shortages of creosote which compel temporary substitution.

Zinc chloride is not used extensively in Europe as a wood preservative, although it is still used to a slight extent in England.

Zinc chloride—oil mixtures are used by the Italian government railways in a process similar to the Rütgers or Card process.

Mercuric chloride (corrosive sublimate) is the standard preservative used for the treatment of poles by the Kyan or soaking process. The customary solution strength is about two-thirds of one per cent. One German plant uses mercuric chloride in a pressure cylinder of the usual type. To avoid corrosion, the tram cars are made of wood and the inside of the cylinder is painted with a protective coating.

Copper sulphate has been used for many years as a pole preservative by the Boucherie (end-pressure) process.

Wolman salts are used quite extensively in Germany for mine timber treatment, and with good success. Triolith, the chief Wolman salt, consisting of sodium fluoride, dinitrophenol, and a bichromate, has also been used occasionally in the treatment of poles and railway ties. In 1915 and 1916 a total of about one million pine ties treated with an absorption of 1/7 to 1/6 lb. of Triolith per cubic foot were installed by the German government railways because there was a shortage of creosote. The results thus far have been good.

Treating Processes

The Rueping process, first used about 1906, in Germany, has now become the chief European process for injecting creosote, finding general use in most of the countries visited.

The full-cell process still finds extensive use in England for creosoting ties, piling, and lumber, and in Holland for piling and miscellaneous lumber; but in other countries, except for special uses such as piling, it seems to have been very largely supplanted by the Rueping process.

Zinc chloride-oil mixture process. The Rütgers process, using a mixture of creosote and zinc chloride seems to have been generally superseded, except that in Italy a similar process is in use. It is similar to the Card process of the United States, and was formerly used in Germany and elsewhere.

The Kyan process, in which the wood, usually poles, is merely soaked for a week or ten days in cold mercuric chloride solution, is still widely employed.

The mercuric chloride pressure process is used by one plant in Germany as an improvement over Kyanizing. Corrosion is prevented by covering the inside of the cylinder and pipes with a patented protective paint or coating and by using wooden track and trams in the cylinder instead of metal.

The Boucherie process consists in applying a preservative solution, usually copper sulphate, to the butt ends of green unpeeled poles and forcing it through them lengthwise by hydrostatic pressure. Since it is rather laborious and time-consuming, however, and not especially cheap, the process does not seem destined to regain its former popularity.

The "Cobra" process, a German method of recent origin, so named for its analogy to the serpent's tooth, injects a preservative paste into poles by means of a hollow needle driven into the wood at close intervals. It seems rather laborious and not especially suitable for high-priced labor. The process must be considered still in the experimental stage.

The Furnos process, developed in Sweden for the treatment of standing poles, consists in digging away the earth for a depth of one or two feet, scraping away decayed wood, charring the pole surface with a blow-torch, and spraying it with creosote. In the United States practically the same method of treatment has been used for several years by the Western Union Telegraph Company.

Adzing, Boring, and Tie Plating Machines

Adzing, boring, and tie plating machines are quite common in Europe because of the prevalence of screw spikes and the extensive use of rail chairs or plates, which are fastened to the ties at the treating plants. Adzing and boring for screw spikes was being done at plants visited in Holland, Belgium, Italy, Germany, and Denmark. The machines were similar in a general way to the machines used in the United States but usually performed fewer operations.

In England, ties are adzed and bored to receive the well-known English rail chair. In a plant of the

Great Western Railway at Hayes, near London, rail chairs were being bolted to the ties by machinery which held the chairs down by heavy pressure while turning the nuts very tightly on four through-bolts.

In Holland and Germany a very heavy tie-plate is being introduced, which is fastened to the ties at the treating plants by means of screw spikes. In the track the rail is held to the tie by clips on the plate and a short lug bolt.

Tie Forms and Sizes

The common English tie is 5 in. by 10 in. by 8½ ft., either round-edged or square-edged, but of fairly regular cross-section. Some English roads, I believe, still use 9 ft. ties, and some, for light traffic, use a size of 4½ by 9 in. by 8½ ft.

Belgium uses rectangular ties, half-round ties, and almost any shape between. The half-round tie must be at least 11 in. wide on the bottom and 5½ in. thick. Flat-top ties may be 5¼ in. thick. All are 8½ ft. long.

Italian first-class normal gage ties are 8½ ft. long, 9.4 in. wide, and 5.5 in. thick. They are thus a little narrower and a little thicker than the English ties. The second-class normal gage ties are 8 ft. long and about ½ in. thinner and narrower than the Class 1 tie.

In Denmark the former standard tie for the government railways was 5 in. by 10 in. by 8½ ft. These, like the English ties, which are of the same size, are often made by sawing a log in half through the center. The Danes are now beginning to use a tie six inches thick, which is usually made like the preferred German type and like our so-called pole ties, by slabbing two sides from a small log, leaving the heart in the center of the stick. The tendency of the Danish government railways is to strengthen the track construction by using larger ties and more of them, as well as by using better tie-plates.

Double ties at joints were seen in use in Germany, Switzerland, and Denmark. These are made by fastening two ties together, edge to edge, with three heavy bolts. Only half as many joint ties are needed per rail-length in these countries as in the United States, because of their practice of laying rail joints parallel instead of staggered as in American practice.

Metal Ties

None of the railway men to whom I talked were enthusiastic about steel ties. Some did not appear willing to discuss the relative technical merits of steel and wood for the purpose, while others frankly expressed their preference for wood on the grounds that the track and fastenings are more easily maintained in good condition on wood ties, and that rolling stock suffers less wear and tear than on steel. Switzerland appears to be going back to wood. Track maintenance expenses in Germany were said to be 50 per cent higher on steel ties than on wood. Broken stone ballast is required for the metal ties. Gravel or other ballast will not do. Many designs of metal ties have been tried out, but none have proved entirely satisfactory. I gathered the impression that pressure of the steel industry for government railway business was perhaps the chief reason for the use of such a high percentage of metal ties. Steel ties at any rate can be used with reasonable success, and whether wood or metal is the better on technical grounds is not necessarily settled by the relative extent of their use in central Europe.

Air seasoning of ties before treatment is practically universal. Steaming or other artificial seasoning of ties was not observed anywhere. Tie piles varied in height from about 6 ft. to perhaps 30 or 35 ft.

In France one company was making high piles by means of a locomotive crane. In the other countries visited it was more common to make piles no higher than men could reach from the ground.

There was universal respect for the tendency of beech to decay during seasoning unless carefully handled. Open piles with plenty of room around them were the rule, for rapid seasoning, even though it favors checking, is preferred because it retards decay.

Although it is general practice to pile oak and pine ties in a manner to avoid decay, they are not as carefully handled as is beech. At one French plant it was considered sufficient to pile oak ties cordwood-fashion.

The seasoning period, as in the United States, seems subject to the press of circumstances. The good intention to season the wood 6 to 12 months before treatment sometimes must give way to the necessity of treating half-seasoned ties to supply a demand for immediate delivery. Failure always to foresee requirements and make purchases in time to permit adequate seasoning is not confined to the railroads of the United States.

Anti-checking devices are universally employed in ties. They are applied as needed during the seasoning process and afterward. Perhaps the most common form is the ordinary S-iron. Another form is a straight piece of metal with several vanes extending at an angle from each side.

Service Records

Service tests, if comprehensive in character and amount and accurately kept, provide the best means of judging the effectiveness of various preservatives and preservative treatments. It was with great disappointment, therefore, that I found it impossible to obtain in Europe very many records of the treating data and the service given by individual groups of ties, poles, or mine timbers. The need for specific tests of this kind does not seem to be generally appreciated there.

In England the life of full-cell creosoted pine ties was variously estimated at 18 to 22 years in main-line track, after which many are still good for further service in secondary tracks.

In the French state railway it is estimated that the life of creosoted beech and oak ties is from 20 to 30 years, averaging about 27 years.

In Germany the oldest Rueping treated pine ties have been in service 20 years and are said to be generally still in good condition. The official interviewed ventured the opinion that their average life might be as much as 35 years. Before the Rueping process was introduced, beech was commonly treated with about 17½ lbs. of creosote per cubic foot by the full-cell process. Many of these ties have been in service since 1896 and 1897.

According to the government statistics of Denmark, the average annual renewals of ties on account of decay since 1910 have been about 3 per cent, and renewals for all causes about 4¼ per cent. This indicates a probable average life against decay of 33 years; or, if all causes of tie renewal are taken into account, the average life is about 25 years.

What's the Answer?

What Our Readers Have to Say on Current Questions That Perplex Those Engaged in Maintaining Tracks, Structures and Water Supply Facilities

QUESTIONS TO BE ANSWERED IN THE APRIL ISSUE

1. *What is the minimum depth of ballast on which track can be maintained satisfactorily on ballast deck bridges?*

2. *Is it advisable to treat heart maple lumber for installation in exterior freight house platforms? Is other timber better adapted for this service?*

3. *What are the relative merits of track liners and lining bars for main line section work?*

4. *To what extent is the maintenance of pipe lines affected by different types of pumps, and also by the condition of the pump?*

5. *What are the relative advantages and disadvantages of flags and metal plates for temporary slow signs?*

6. *What is the best method of protecting the tops of creosoted piles after cutting them off?*

7. *What are the qualifications of a supervisor's clerk and what should be his duties?*

8. *Where the interior walls of shops and engine houses are painted white to increase the distribution of light, what is the best method of keeping them white?*

Cinder Concrete

For what purpose can cinder concrete be used with economy and safety?

Does Not Favor Its Use

By A. T. Hawk
Engineer of Buildings, Chicago, Rock Island & Pacific, Chicago

Cinder concrete was used extensively in buildings 20 years ago where light weight was desired but its use has greatly decreased in recent years. I believe that there are few places where it is justified.

When the LaSalle street station of the Chicago, Rock Island & Pacific and the New York Central at Chicago was built in 1902 reinforced concrete slabs were used on the roof of the train sheds which is 214 ft. wide and over 500 ft. long. These slabs were 2 ft. wide, 5 ft. long and about 3 in. thick, reinforced with triangular mesh. In order to lighten the weight the outer edges of the slabs were made of gravel concrete while cinder concrete was used for the interior portions.

About 10 years after the station was built one of these concrete slabs failed and an examination showed that all of the slabs were showing deterioration to such an extent that it was necessary to replace them. In some of the slabs the reinforcement had entirely disappeared owing to corrosion, this action being hastened by the moisture from condensation on the under part of the slabs.

One of the serious objections to the use of cinders for concrete is the wide variation in their characteristics. If they consisted entirely of the residue from completely burned coal it is fair to assume that they might make a satisfactory coarse aggregate, but most cinders, especially those obtained from locomotives, are composed of coal which has passed through various stages of combustion, together with pieces of slate and other extraneous matter which has little strength. Cinders from such a source, when wet, are also apt to cause acids that soon cause the failure of the reinforcement, hence such concrete should not be used where strength is an important factor. Cinder concrete has been used for floors in fireproof buildings but even for such purposes it is felt that other materials are to be preferred.

Winter Uses for Tie Tamper Units

What are the practical winter uses of pneumatic or electric tie tamper units, aside from tamping ballast?

They Are of Great Advantage in Winter Rail Laying

By G. A. Phillips
Engineer Maintenance of Way, Lehigh Valley, Bethlehem, Pa.

On roads equipped with pneumatic tampers in a climate where it is impossible to surface track the year round it becomes necessary to utilize them to the fullest extent in order to realize on their investment. The Lehigh Valley is equipped with many of these machines, largely of the portable 12-tool type with an 8-in. by 9-in. cylinder. Our winter rail schedule provides for laying three or more track miles per day and requires, for economy, that the bonding be performed by machinery rather than by hand. The portable pneumatic tamper compressor

enables us to do this and it also utilized it for operating nut-tightening machines.

Portable air compressors are further used to great advantage during winter weather on the Lehigh Valley for furnishing air for riveting, wood boring machines, reamers, jack hammers, drilling for blasting, etc.; also for supplying air for sand blasting, cement gun operation, pumping water and paint spraying.

Air Tampers May Be Used for a Variety of Purposes

By G. W. Morrow
Representative, Ingersoll-Rand Company, Chicago, Ill.

The demand for economies in maintenance of way work has brought out numerous uses for pneumatic tie tampers other than tamping ballast and has proven that the savings thus effected warrant the adoption of these devices not only on account of reducing labor costs but in order to get a better return on the initial investment as the machines can be utilized for work spread out over the entire year.

As the majority of railroads make a reduction in track forces during the winter season, the use of mechanical equipment has assisted the maintenance departments to cover much work that otherwise would entail extra labor. By substituting a pointed steel bar for the tamping bar in a pneumatic tie tamper this tool will serve for loosening frozen material in cars, such as coal, cinders, etc., and do the work faster than a pick. By inserting a chisel point other operations can be performed such as cutting ice around switches, engine house terminals or track water troughs as well as asphalt and frozen earth. Where damp or frozen material adheres to the sides of cars, the tie tamper is used as a vibrating machine for rapping the outside of the car in order to start the material to flow.

The tie tamper compressor, being a self-propelled unit on flanged wheels, is utilized to furnish power for rail-laying air tools such as pneumatic wrenches, bonding and rail drills and spike drivers and where screw spikes are used much labor and time are saved by the use of a pneumatic wood-boring machine and screw spike driver.

For the construction or maintenance of bridges the air compressor is practically indispensable. The tie tamper compressor has been found most adaptable for this purpose on railroads on account of the features involved in its construction, making it portable and easily handled. The air is used to run such tools as drills and reamers, riveting hammers, scaling hammers, wire brush cleaners, sand blast, paint spray machines, cement guns, whitewash machines and for culvert work. An air hoist proves a big labor saver in hoisting bridge members or in dragline work, having a straight lifting capacity of 1,500 lb., which can be multiplied many times by the use of block and tackle.

When the tie tamping season is ended the compressor will be found a very useful accessory if placed at a busy junction point or a large yard to furnish air in connection with snow-melting devices requiring compressed air to atomize the fuel used. Straight air has also been used successfully to blow out snow or dirt from switches, movable points, interlocking bars and car retarders at hump yards. The compressor, placed at a busy location, will then be available for use as a source of power to run bolt tightening machines, rail drills, etc., where rail renewals are made in the winter. In addition to these uses above described the tie tamper compressor affords power for breaking concrete, hard frozen ground, drilling holes for pinning-up work on rock cliffs, or boulders for blasting and for emergency use to furnish air for pipe lines to operate pneumatic switches and signals and for pumping water. In short, a tie tamper compressor can be utilized for any purpose requiring compressed air up to the limit of the capacity of the machine.

Useful for Removing Ice and for Operating Power Wrenches

By J. D. Keiley
Supervisor, Chesapeake & Ohio, Russell, Ky

Pneumatic and electric tamping outfits can be used to great advantage in the winter time in chopping ice away from the tracks around water columns. They can also be used with economy to chop away frozen cinders around cinder pits. They are useful in loosening practically any frozen material in open top cars, such as coal, cinders, sand, etc., provided the unloading is done where the tamping outfits are readily available. When portable air compressor outfits are available a pneumatic wrench can be used with economy in any extensive renewal of angle bars or in the renewal or tightening of bolts.

The Electric Power Units Have Many Uses in Winter

By C. Jackson
Vice-President and General Manager, Electric Tamper & Equipment Company, Chicago, Ill.

Electric tie tamper equipment consists of three separate units as follows: The portable plant used for generating electric current, the tie tamper tools or "guns," and the flexible line cable for transmitting the current from the power plant to the tools. The winter use of the tamper tools or "guns" is limited, but roads using water pans have fitted the tamper tools with a pointed pick in place of the tamper bar and use the machines for the removal of ice around the track and also from station platforms.

Aside from the tamper tools or "guns" the portable power units, consisting of a gasoline engine direct-connected to a generator which are furnished in various capacities, may be used as a source of electrical energy to provide current where there is no existing or convenient power circuit. Since these power units furnish either standard 110 volts 60 cycle alternating current or 110 volts direct current, they may be used for the operation of all types of portable electric tools and for various sorts of lighting. These units may be used to good advantage to furnish current for portable floodlights for tunnels, yards and repair sheds on dark days or early evenings and for lighting outfit cars, temporary offices, wrecking cranes, coal chutes, fuel storage yards, reclamation yards, tie and material yards and other locations where temporary work is performed during winter months. These portable electric plants have been found particularly valuable in the event of serious wrecks where the use of open flame lights is not practical and also in serious washouts where night work is essential. The units are so compact and portable that they can be placed conveniently to furnish lights to the best advantage for emergency situations.

The power units are also used for operating any

commercial motor driven tool such as drills, saws, grinders and similar standard appliances and can be operated economically in isolated locations, by simply placing the portable power units conveniently and extending the line cable to the various devices. There is always a considerable amount of drilling and sawing of rail to be done in yards and terminals where space is limited and permanent power is not available. In such locations the portable power units may be set up without delay and provide power to operate tools that are much more efficient than the usual hand tools, a matter of importance, due to the generally reduced force that performs the work during the winter months. In rail-laying operations the power units furnish satisfactory power for bonding and rail drills, saws and power wrenches.

A number of portable rail sawing plants have been in operation for the past two years, and it has been found that it is economical to saw rail in track where the ends are battered, thus eliminating the necessity of shipping the rail to and from a central sawing plant. Portable tie tamping units are well adapted for this class of work.

In addition to furnishing light, if required, the power units are useful for the operation of portable motor driven tools on bridge work, such as saws, drills, tie dappers, scratch brushes, wood or metal saws and tool grinders. They may also be used for all sorts of emergency situations in signal work, such as charging batteries, temporary or emergency power supply, lighting, bond drilling, switch and lever drilling.

Care in Heating Concrete Materials

When cold weather requires the heating of concrete materials, is it advisable to guard against overheating as well as insufficient heating?

Overheating Should Be Avoided

By H. E. Van Ness
Construction Engineer, Central Railroad of New Jersey, Jersey City, N. J.

It is our practice to heat all of the concrete materials other than the cement immediately before mixing. The sand and gravel are heated by steam in the charging hoppers and the water is heated by steam in the tank attached to the measuring device. Our water is never heated above 180 deg. F., and the sand and gravel never above 100 deg. F., generally from 72 deg. to 80 deg. F.

I know of only one instance where concrete deposited showed an undesirable high temperature and that was during a very cold period in January, 1924, when we cast some concrete base sections 24 in. thick for a floating caisson pier on launching ways, controlling the temperature of the mix as above indicated. Immediately upon completing the depositing of the concrete in the forms the whole was covered with a tarpaulin and on the windward side an extra tarpaulin was placed over the first layers and several perforated steam pipes distributed underneath the tarpaulins throughout the work. The following morning one corner of the base section was found to be 132 deg. F., and showed an undesirable amount of drying out. The whole was immediately wetted down with warm water, the amount of steam used was reduced and no harm resulted.

In my opinion it is advisable to guard against overheating in that there is danger from drying out the water too rapidly, even when the temperature is not sufficient to injure the cement itself.

It Is Not Necessary

By M. Hirschthal
Concrete Engineer, Delaware, Lackawanna & Western, Hoboken, N. J.

It is not necessary to guard against the overheating of concrete materials in cold weather. While the specifications generally read that concrete shall have a temperature of not less than 50 deg. nor more than 120 deg. F., when deposited, the probabilities are that the concrete will generally be nearer the lower limit than the higher limit, inasmuch as the heating of materials is a process involving an expense which varies just about in proportion to the intensity of the heating supplied, and contractors are not prone to throw money away on excessive requirements. While it is conceivable that a degree of heat can be produced that will make gravel aggregate "pop," and therefore injure this material as well as the sand, this is not likely to occur under practically any conditions that may obtain in the field, particularly as these temperatures will have to be very high.

Repairs of Heaved Highway Crossings

What is the best method of repairing a bituminous or plank highway crossing which has heaved badly, when such repair is advisable before the frost leaves the ground?

Repairs Will Depend on the Type of Crossing

By H. A. Douglas
Maintenance Engineer, Longview, Portland & Northern, Longview, Wash.

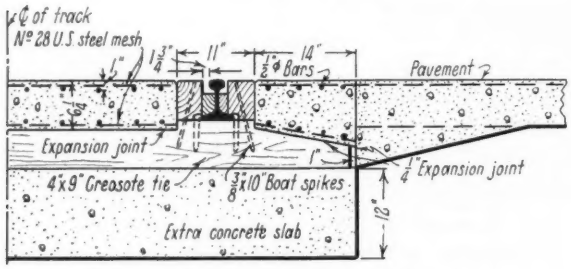
Bituminous crossings which are in need of repairs present a question of considerable moment for maintenance forces, especially when such repair is imperative before the frost leaves the ground, or when there is a possibility of additional distortion of the material by a continuance of cold weather. If it is assumed by "bituminous" that the ordinary "black top" is meant it would seem that the only way to make repairs is to cut out or discard all pieces which are loose, filling again with the same material, but if the trouble originates in the concrete base, where one is used, the fault must lie in the mixture or in the placing of this base when first installed. This condition naturally necessitates the temporary repair of the base until such time as renewal may be made.

Tracks are laid to a specified line and grade, so that if a crossing is out of surface, the settling or shifting of the track may be partly responsible for the condition and this should be remedied before the crossing is repaired. The drainage of the crossing may be at fault in which case it is necessary to get rid of all pockets where water might lodge, causing upheaval.

Plank crossings which have worked out of surface can be repaired cheaply by reversing the planks and fastening them to the ties or supports with suitable lag screws at stated intervals, instead of boat spikes. However, when a plank crossing is out of surface seriously I recommend the replacement with new planks, for evidently the planks have outlived their usefulness.

When traffic on the highway is heavy, plank or bituminous crossings require continual maintenance.

My experience has been that a full concrete crossing of recognized mix, while costing considerably more than these types, will in the long run be safer and more economical, for we all know that the maintenance of such structures is a real "white elephant."



Section of a Concrete Highway Crossing

A small sketch is shown herewith of a design for a concrete track crossing, costing approximately $160 for a 20-ft. roadway and built under the writer's supervision, which has given excellent service and will, in his opinion, have a life of three times that of plank or bituminous crossings.

Repairs Must Usually Be of a Temporary Nature

By Roadmaster

The repair of highway crossings which have heaved badly from the frost is a vexing problem since the heaving is seldom uniform and requires varying thicknesses of shims to provide a satisfactory surface for the track. In the case of plank crossings this will require different thicknesses of furring or supports for the crossing and the work may have to be done several times before the track finally settles back to its original position. In the case of asphalt crossings it may be necessary to remove the asphalt between the rails and along the ends of the ties to permit shimming to be done, substituting plank until proper measures may be taken in the spring to avoid a recurrence of the trouble.

The best way is to head off the trouble before it develops and to install ample drainage and good ballast at all important crossings, especially where bituminous or other semi-permanent materials are to be used. Proper drainage and foundation is always necessary but special pains should be taken where it is known that the crossing has heaved.

Flickering of Switch Lamps

What causes the flame in a switch lamp to flicker and how can it be remedied?

The Proper Design of the Draft System Is Important

By C. W. Breed

Engineer of Standards, Chicago, Burlington & Quincy, Chicago

There are several reasons for the flickering of an oil flame in switch lamps, the principal one being poorly designed ventilation, particularly what is known as lower draft systems.

A properly constructed upper draft system of ventilation will reduce the flickering to a minimum as well as prevent the lamp from sweating. Any air entering the interior or flame chamber of the lamp, except through the proper air intake holes provided for in the ventilation, will cause the flame to flicker and will also cause sweating.

Unvented burners and founts will cause flickering as there is no escape for the gases which gather in the top of the oil fount except through the wick tube. Other causes are dirty burners and water in the oil. Oil flames are likely to flicker whenever a new wick is used on account of the air in the weave of the wick. This is temporary, however, as the oil gradually forces the air out of the weave.

A properly constructed lamp embodying the upper draft system of ventilation, together with suitable care in handling, should reduce flickering.

Poor Maintenance Is Often Responsible

By J. D. Keiley

Supervisor, Chesapeake & Ohio, Russell, Ky.

There are a number of reasons for the flickering of switch lamps and most of these may be assigned to poor maintenance in the following details: Improper regulation of the vents, causing drafts or an improper supply of air for combustion; failure to keep the wicks trimmed or adjusted properly; and failure to empty the oil fount at least once every three months. The interior of switch lamps often "sweat" and some of the condensed moisture finds its way into the oil, while other impurities sometimes get into the oil when the founts are being filled. A good grade of oil, free from impurities, must be used. To obtain the best indications the lenses must be kept spotlessly clean, both inside and out, and care must be taken to wipe surplus oil from the fount or other parts of the inside of the lamp.

Installing Pipe Culverts in Winter

Is it economical to install or renew pipe culverts during the winter season on roads in northern territory?

The Practice Is Economical

By J. A. Heaman

Chief Engineer, Grand Trunk System, Detroit, Mich.

It is economical to install pipe culverts during the winter for the reason that frequently the driving of piles for temporary structures is unnecessary then, whereas in the summer it would be required. In the winter, with two or three feet of frost, the stringers can be carried on mud sills and the slopes will stand safely under the load. Also less water is usually encountered in the winter than in the summer, which is quite a factor in some instances.

On some work the excavation may be more difficult in winter, but generally there is little difference and, in some instances, on account of lower water, the excavation can be done more economically in the winter season. Filling can usually be postponed until the spring or summer and a number of culverts with pipe installations make excellent places for the use of strippings and other materials which might be wasted if locations for their disposal had not been supplied.

It Is Not Economical

By James L. Miller

Engineer of Bridges, New York Central, New York

Except in emergencies due to broken down culverts it is not economical to install pipe culverts in the winter on northern roads for a number of rea-

sons. In the first place it is necessary to disturb the track to place the falsework and to make the necessary excavation and as the track cannot be restored permanently until the frost leaves the ground this entails costly inspection and maintenance. Excavation is more difficult, hence more costly, and the backfill is unsatisfactory, due to being frozen. The foundation for the pipe is apt to be unsatisfactory and may be the cause of breaks or settling of the culvert; long sections of pipe are recommended to avoid these foundation defects as much as possible, but where they exist, trouble and expense is almost sure to follow. Headwalls are also more expensive to place in cold weather due to the precautions which must be taken to protect them against frost.

To avoid the troubles cited above it is generally found best to restrict the placing of pipe culverts in winter to emergencies and to make the regular installations or replacements in the other months of the year.

Winter Operation of Motor Cars

What special precautions should be taken in the operation of motor cars in the winter from the standpoints both of safety and efficiency?

Precautions to Be Observed

By C. H. Ordas
Supervisor of Motor Cars, Chicago, Mliwaukee & St. Paul, Chicago

In operating motor cars in winter the following instructions should be observed:

1. Read the manufacturer's book of instructions and become thoroughly familiar with all the parts of the car.

2. Keep every part of the car and engine in the best possible condition, making weekly inspections to see that every part is properly adjusted and safe for operation. Look the car over carefully, then start the engine and run it to warm it up before getting out on the main line with it. Unless you are satisfied that everything is operating properly, you should not get away from your tool house. You have a great responsibility both for yourself and members of your crew, and for this reason, must be sure your car will get over your section and back without trouble that might result in hardships.

3. Remove from the car all tools and supplies not needed on the trip, as every ounce on the car adds to the difficulty in removing it from the track quickly when necessary. Take a full tank of gas and when operating water cooled engines, use just enough water in the hopper to cool the engine properly as you may have to lift it all; a hopper about 60 per cent full should suffice. Cars are more difficult to remove from the track when there is snow on the ground, also when men are bundled up to protect themselves from the cold. If it is very cold and you are obliged to stop for any long period, cover the hopper to prevent the water freezing and cracking. It may even be necessary to draw off the water into some container to prevent freezing and cracking the water jacket.

4. Before leaving the tool house, be sure every man is properly clothed and shod, to insure against cold and poor footing, in the event it became necessary to walk home.

5. Take the following precautions when starting the engine to warm it up before getting out on the main line. If you have a water cooled engine, and have difficulty in starting it, use hot water in the hopper to start on. If you have a direct-connected engine, you can heat up the cylinders with hot bags of sand, hot stones, etc., but an open flame should not be resorted to. Never run the engine in the tool house, as the exhaust is a poisonous gas and may be fatal if you inhale it for even a short period. Be sure the spark plugs are clean and the carburetor and spark coil properly adjusted before leaving headquarters. The ignition wires should also be in good condition, the secondary running from coil to the spark plug should be as short as possible, and none of the wires should hang near iron where the insulation may wear through and cause short circuits.

6. If you must do any adjusting of the parts of the car and engine, it is best to do it within station limits on the house or passing track and not on the main line. If there is any doubt about any feature of the operation of the car and engine that you do not understand, do not hesitate to ask the motor car supervisor or inspector to explain it thoroughly until you understand. Do this before you get into trouble out on the line.

7. Since the rail in cold weather and in snow conditions may be slippery be sure every brake shoe on the car is functioning properly, making full and even contact with the wheels, then run slow enough so you can stop when necessary before causing any damage. Remember that in cold weather pedestrians and drivers of vehicles are also bundled up and cold, which might interfere with their seeing or hearing you approach.

When there is snow or ice under foot, take extra precautions at all times to prevent injury in getting on or off the car, or when lifting it on and off the track. Since you cannot move as fast or hear as well under such conditions take extra precautions against approaching trains. If the snow is too high to remove the car at points other than highway crossings, obtain a good line-up on trains before venturing out on the main line, or if you are where line-ups cannot be had, flag to protect against trains. When you see a train approaching, take the car off immediately if possible, and do not try to beat the train to some setting-off point. If necessary to run to some favorable set-off and there is time to do it, signal the engine or train crew so that they may know you have seen the train and are doing all you can to clear the track. When the car and crew are clear of the track, especially where the view is poor, "high ball" the train that all may know you are into clear. Scheduled trains are not to be stopped unless absolutely necessary to prevent an accident.

8. In winter be unusually cautious when running over highway crossings and be prepared to stop before crossing them, since the flangeways may be full of snow or frozen mud, and pedestrians and vehicles may slip in front of you at any time, causing injury or derailment. Good brakes, properly adjusted, properly applied at the right time, and proper speed under all conditions, have saved many an injury or death. Dispute the right of way with no one—play safe at all times.

9. Devote your whole time to running and seeing what is ahead of you, and designate some one to watch behind. If you have a wind shield on the car,

be sure that it is equipped with proper windows which are clear, or that the shield is low enough so that you can look over it. Get off the track if you do not know operating conditions are safe. Operate slowly enough so that it will not be necessary to slam on the brakes and slide the wheels; you can make a better stop by not sliding the wheels. In slamming on the brakes you may break the brake lever or other braking mechanism, resulting in reduced braking efficiency just when you need to stop quickly.

10. Before and during cold weather watch carefully axles and bearings to see that they have not worn beyond the limits, since badly worn axles are weak and may break more readily in cold weather. Use thinner grease or oil in roller bearings in cold weather than in summer, so that the rollers or balls will not become locked and cut the axle, thereby weakening it.

11. A few extra hours spent in reading and observing the manufacturer's instructions as well as the railway's rules and instructions on the operation and maintenance of your motor car, will be well spent and rewarded by more satisfactory operating results.

All Parts, Especially the Carburetor, Must Be Kept in Proper Adjustment

By C. R. KNOWLES
Superintendent Water Service, Illinois Central, Chicago

One of the important features of winter operation of motor cars is the proper adjustment of the carburetor. A gasoline engine will not start as readily in cold weather as in warm weather for the reason that it is more difficult to vaporize the fuel at low temperatures, with the result that more fuel is required in starting the engine than after the engine has been warmed up, due to the fact that only the lighter parts of the fuel will be vaporized to the extent that they can be ignited in a cold cylinder. As a result it is a common practice with motor car operators to adjust the carburetor so that there will be a rich mixture of gasoline to permit of the engine starting easily. This is extremely wasteful and results in flooding the engine, causing back-firing and excessive carbon formation, and should be avoided. Precaution should also be taken to avoid excessive use of the choke on the carburetor for the same reason as it draws charges of raw gasoline into the cylinder and the part that is not burned readily goes into the crank case. Where a splash system of lubrication is used this interferes seriously with the proper lubrication of the engine on account of the dilution of the oil with gasoline. The cylinders may be primed in extremely cold weather by injecting a teaspoonful of gasoline into each cylinder through the priming cups. Drawing the gasoline in through the priming cups breaks the fuel up so that it is easily fired.

Warming the gasoline in some manner is also of material assistance in starting the cold engine. Of course, an open flame should never be used in warming either the gasoline or the engine but it is sometimes found advantageous to heat the lubricating oil before mixing it with the gasoline, or the gasoline may be set in a bucket of hot water before pouring it into the fuel tank. Other methods are to use bags of warm salt or sand around the fuel tank and carburetor which assist materially in vaporizing the gasoline and starting the cold engine. Much better results will be obtained in the operation of motor cars during the winter months if a gasoline of high gravity is used.

Greater precautions are necessary to avoid injury to men in cold weather due to the fact that winter clothing retards their movements to such an extent that the danger of personal injury is increased, particularly in getting on and off cars. When ears are covered the hazard of being struck by trains is increased, due to the fact that the approach of a train cannot be heard as readily.

The proper adjustment of brakes is also of more importance in winter than in summer. Brakes should be adjusted at all times to guard against the possibility of being unable to stop on slippery rails. An ill-fitting brake shoe may permit an accumulation of frost or ice between the shoe and the tire of the wheel that will make the brakes inoperative, hence the brakes should be adjusted in such a manner that frost cannot accumulate under the shoe.

Run Carefully Through Frogs and Road Crossings

By J. D. KEILEY
Supervisor, Chesapeake & Ohio, Russell, Ky.

Special precautions should be taken in the operation of all types of motor cars in cold weather in running through frogs and road crossings where there is a possibility of the flangeway being full of ice and packed snow. This is about the most frequent cause of motor car derailments in winter time. Where the weight of the motor car is evenly distributed on the four wheels there is less chance for it to derail on an ice-coated rail than the side load motor car.

Special care must be taken in shoving the car to start it so as not to slip and injure the person starting the car. In cold weather there is a temptation for the operator to cover up his ears and this is dangerous because he cannot hear approaching trains. In cold weather the operator is apt to turn his head in the opposite direction from which he is going and not keep a close lookout for approaching trains or other obstructions.

On water-cooled cars care must always be taken not to use too much water and to see that it does not freeze and crack the casting. At the best, motor car operation in the winter is more hazardous than at any other time, and for that reason the operator must keep in touch with the dispatcher if possible and also see that his car is equipped with the necessary complement of lamps, torpedoes and other flagging equipment.

The Use of Booster Pumps

Is the use of booster pumps recommended for increasing the flow in long pipe lines where friction losses reduce the capacity of the line below the requirements?

Cost and Reliability of Service Must Be Considered

By J. R. HICKOX
Hydraulic Engineer, Chicago, Burlington & Quincy, Chicago

There is no hard and fast rule that will apply to this problem, and each case should be considered independently. The answer depends upon what it would cost to replace the line with a new line of sufficient size to deliver the required amount without a booster, as compared with the cost of installing and operating the booster pump. In some cases the reliability of service also enters into the question.

As a general proposition, where a reasonable interest and depreciation on the cost of a new line is less than the interest, depreciation and repairs on the booster pump equipment, plus the cost of operating this pump, the booster pump should not be recommended, but if the conditions are reversed and the reliability of service with the booster pump is not a deciding factor, then the booster pump could be very properly used.

Decision Depends Upon a Number of Factors

By W. H. Armstrong
Manager Tie Tamper Sales, Ingersoll-Rand Company, New York

The booster pump can be used to increase the flow in long pipe lines of small diameter where friction losses reduce the capacity of the line below the requirements but the question as to the use of such a pump will depend upon a number of conditions, among which are the capacities involved, the source of supply, the difference in elevation between the source of supply and the point of discharge in a gravity supply, and the point at which the booster pump should be installed in the line. In some instances it may be advisable to locate the pump at the source of supply and at others it may be preferable to install it at some point along the line.

Railroads Must Adopt Depreciation Accounting

THE Interstate Commerce Commission has issued an order requiring the railroads to institute a system of depreciation accounting effective January 1, 1928. The order prescribes the straight line method of depreciation and in the case of railroads the system is to cover 44 classes of property.

Percentage rates are not prescribed but each railroad is required to file by September 1, 1927, estimates of the composite percentage rate for each primary account and after a check of this and other data a temporary order will be issued prescribing rates for each carrier.

The following statements taken from the commission's order give some of the reasons for issuing the order.

With the exception of land and grading, most property units which make up the plant of a railroad are gradually worn out in operation or are abandoned from time to time in favor of better substitutes. The cost of property thus consumed or abandoned is plainly a part of the cost of rendering service, and the accounts should conform to and adequately record this fact.

Depreciation accounting with all its difficulties is, we are persuaded, a method which will produce a much more nearly accurate reflection of the facts than will retirement accounting. While we do not minimize the difficulties and possible dangers, we are confident that in the course of actual practice and experience they will continually decrease in importance. In the early days of every form of public supervision of private enterprise the difficulties to be encountered create alarm by their apparent multitude and magnitude. In actual practice they gradually lose their formidable character as principles are developed and precedents set. So it will be with depreciation accounting.

The classes of property for which depreciation accounting is required by the order are as follows:

Road:
- Underground power tubes.
- Tunnels and subways.
- Bridges, trestles and culverts.
- Elevated structures.
- Ties.
- Rails.
- Other track material.
- Ballast.
- Right-of-way fences.
- Snow and sand fences and snowsheds.
- Crossings and signs.
- Station and office buildings.
- Roadway buildings.
- Water stations.
- Fuel stations.
- Shops and engine houses.
- Grain elevators.
- Storage warehouses.
- Wharves and docks.
- Coal and ore wharves.
- Gas producing plants.
- Telegraph and telephone lines.
- Signals and interlockers.
- Power dams, canals and pipe lines.
- Power plant buildings.
- Power substation buildings.
- Power transmission systems.
- Power distribution systems.
- Power line poles and fixtures.
- Underground conduits.
- Miscellaneous structures.
- Paving.
- Roadway machines.
- Shop machinery.
- Power plant machinery.
- Power substation apparatus.

Equipment:
- Steam locomotives.
- Other locomotives.
- Freight-train cars.
- Passenger-train cars.
- Motor equipment of cars.
- Floating equipment.
- Work equipment.
- Miscellaneous equipment.

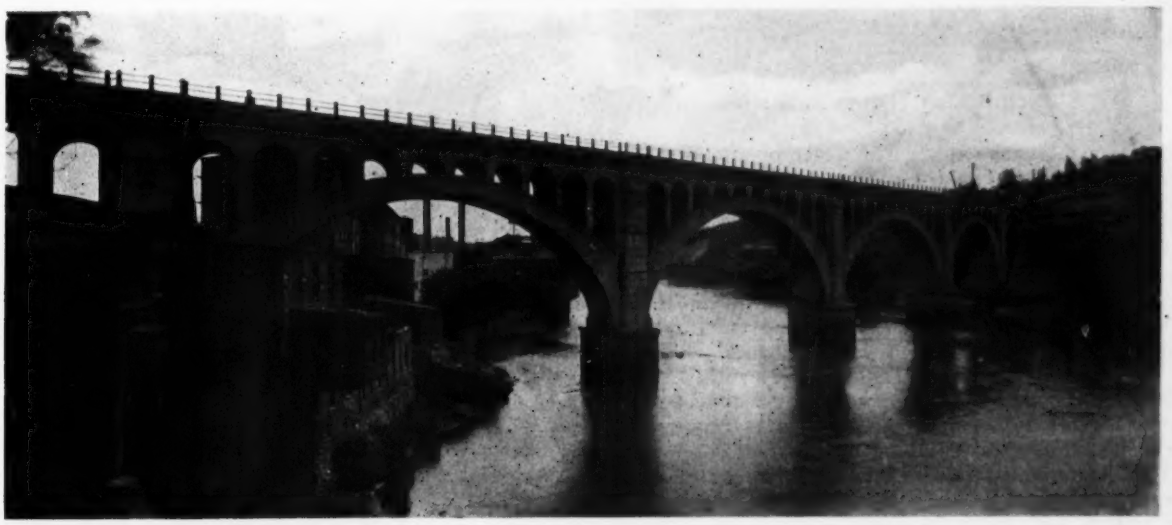
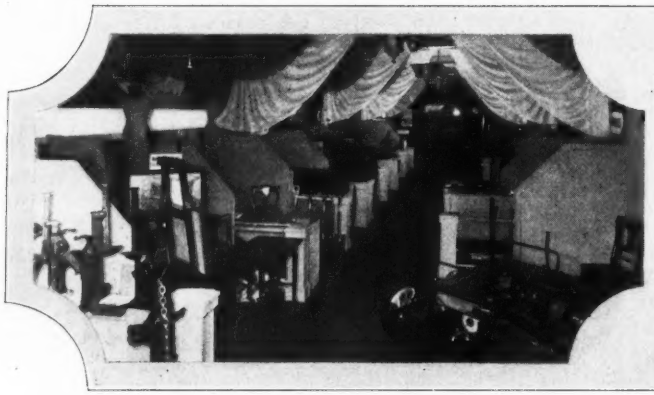


Photo by Jennings, Philadelphia.

The Pennsylvania's Concrete Arch Bridge Over the Schuylkill River at Manayunk, Pa.



New and Improved Devices

Electric Snow Melters Save Labor During Winter Storms

THE Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has developed an electric snow melter for use at switches or movable point frogs in any location where electric current is available. The snow melter unit consists of a heating element made up of two coils about ¼ in. in diameter of nickel-chromium wire connected in parallel and supported in four grooved refractory porcelain insulator blocks which are held firmly in a sheet steel trough running lengthwise through a standard 3½-in. black steel pipe 25 in. long. The trough, terminal and bolts are sherardized to prevent rusting. The trough is attached, by means of insulated bolts, to cross bars which are welded inside

Electric Snow Melters in Service

the pipe at each end. The ends of the pipe are equipped with standard pipe caps screwed on and red leaded for the purpose of making the units water-tight. Both terminals are located at the same end of the pipe and two water-tight bushing outlet connections are supplied through which three feet of power leads are brought out. A steel terminal clip is welded to the outside of the pipe to provide a means for grounding the case of the unit.

The heater is rated at 1.2 kw. on 54 volts. It has been determined through experiment that 12 heaters or a power input of about 15 kw. is required to give the proper distribution of heat over one switch. The arrangement of the heaters in a circuit is, of course, dependent on the voltage of the current supplied.

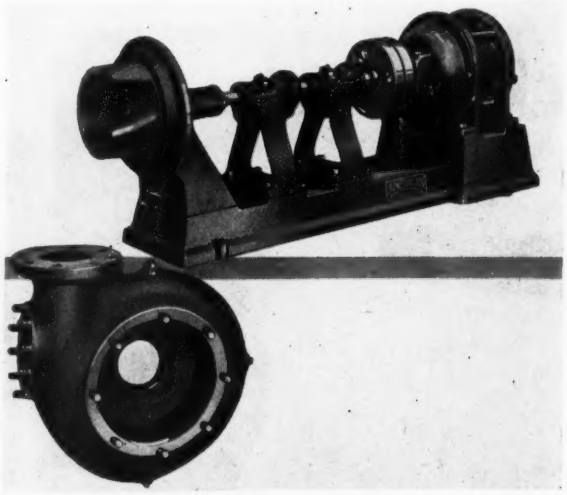
To install these heaters it is only necessary to remove enough of the ballast between the ties so that the heater can be placed with its top approximately 1 to 1½ in. below the switch, frog or rail.

These snow melters are said to be designed and built to withstand the rough usage to which they are naturally subjected in connection with railway track work. The steel pipe casing is reported to be sturdy enough to resist damage due to being struck by picks and shovels. The heating element is securely fastened within the casing so that even heavy jars will not cause any damage. The snow melters are shipped completely assembled and water-tight, ready to be installed.

Careful service tests of these snow melters were made by the Interborough Rapid Transit Company in New York, as a result of which 440 units were installed for service during the winter of 1925-26. The performance of these heaters during that winter and the economies in labor resulting therefrom, have resulted in the purchase and installation of 1400 additional units for use during the present winter.

A Non-Clogging Centrifugal Pump

A CENTRIFUGAL pump designed especially for the handling of sewage or other water or liquids carrying considerable quantities of debris, has been developed by the American Well Works, Aurora, Ill. It is known as a non-clogging pump because the impeller has been designed to offer little opportunity



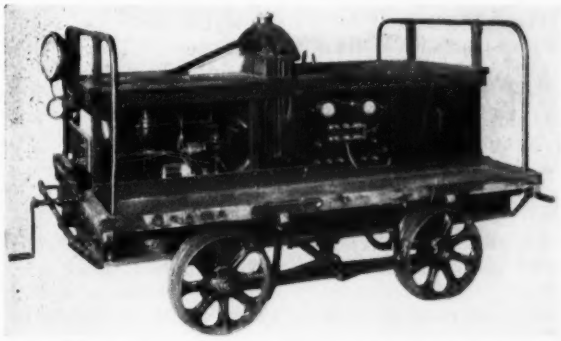
The Non-Clogging Centrifugal Pump with the Casing Removed

for suspended matter in the liquid to adhere to it.

As seen in the photograph, the impeller has but a single blade with a single peripheral passage on one side occupying about one-quarter of the circumference. By reason of this arrangement water entering the open end of the impeller is carried out through this passage and through the discharge pipe in a solid mass without being broken up into separate streams as is the case with an impeller of the usual type with several outlet passages. The pump with the new type of impeller avoids the possibility of different parts of a stringy piece of debris being swept into different outlet passages with the result that it is caught on the impeller.

A Self-Propelled Welding Car for Use on Track Work

THE Electric Arc Cutting & Welding Co., Newark, N. J., has developed a gas-electric, self-propelled welding car, which is specially adapted for building up battered rail ends, repairing frogs, welding rail bonds and other work in the maintenance of way department. This car, which is said to be the first self-propelled unit of its type put on the market, consists of a gas engine-driven welding generator, mounted on a standard gage track car equipped with cast steel flanged wheels and an electric driving motor. The entire car weighs less than a ton, and one side is insulated so that it will not operate track signals. In order to facilitate the removal



The Car Has Sufficient Power to Haul Two Loaded Trailers

of the car from the track, a special underframe has been provided on which the car can be pivoted and skidded over the outer rail after it has been partially turned.

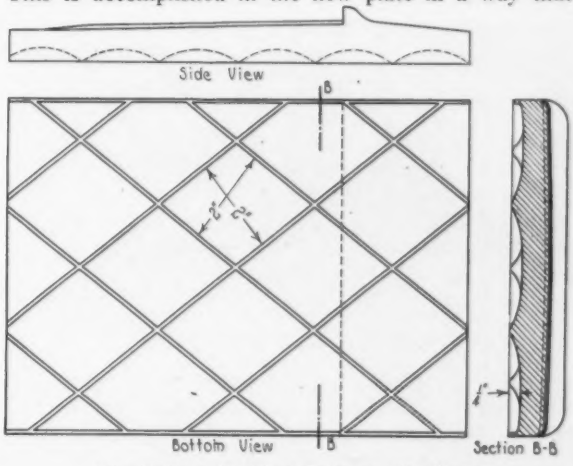
The driving motor, which is driven by a 25 hp. gas engine, is a standard vehicle motor which propels the car through a chain and sprocket drive. The control, which consists of a special interlocking arrangement, provides for uniform acceleration with any desired speed in either direction and is so arranged that the car cannot be moved when the generator is being used for welding. A special lighting transformer on the car provides for illuminating work at night. A headlight and a tail light are also provided on the car.

The oiling system has a unique feature in that it is so interlocked with the ignition system that magnetic ignition is cut off in case the oil gets too low or the oil pump fails to work. In addition to the interlocked speed-limiting governor mentioned above, the gasoline engine is also provided with an automatic throttle governor for welding, which causes the engine to idle until the welding electrode is actually touched to the work. The engine immediately resumes idling when the arc is broken and it is expected that this feature will lead to economy of operation and prolong the life of the engine.

The welding generator supplies both alternating and direct current for all arc welding, sufficient current being generated to operate one welding arc at distances up to about 1,000 ft. from the generator. By means of a series differential field the generator provides 20-volt current for metallic-arc welding, a series compound field providing 40-volt welding current for carbon-arc welding. The generator runs on ball bearings and is equipped with an interpole commutating field. Through the transformer on the car, 110 and 220 volts can be obtained for the operation of drills and grinders, as well as for illuminating purposes.

Sellers Introduces New Form of Anchor Bottom Tie Plate

THE Sellers Manufacturing Company has introduced a modification of its diamond-pattern, anchor-bottom tie plate which retains the essential features of the old design but offers several improvements, among which the most important is increased stiffness for a given weight of plate. The pattern of the old plate presented a flat surface cut up into a diamond grid by ridges $\frac{5}{32}$ in. high by $\frac{3}{32}$ in. wide, the contact edges of these ribs being formed by planes having intersecting angles of about 84 deg. These ribs not only provide anchorage by pressing into the wood but also stiffen the plate. However, it has been found by experience that the anchorage afforded by the ribs is more than is necessary so a new design was developed with a view to distributing the metal in the plate in a manner that will provide greater stiffness for the same weight of plate and still insure adequate anchorage. This is accomplished in the new plate in a way that



The Sellers Modified Bottom Tie Plate

effects a less abrupt distortion of the wood fibres than is the case with the old plate.

As shown in the drawing, the under side of the plate is shaped in the form of flat diamond-shaped domes having a rise of ¼ in. and a span of 2 in. Furthermore, the intersecting arches of adjacent domes, instead of meeting at well defined lines, are rounded off to smooth curves. As a consequence, the first action in seating the plate under the pressure of traffic is to bend the wood fibres down to the curves of the dome intersec-

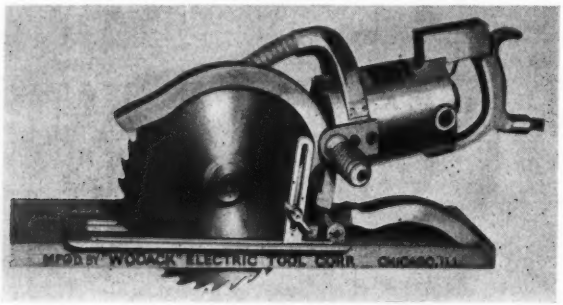
tions. With repeated pressure the fibres are further depressed until eventually the entire surface of the tie conforms to the exact shape of the under side of the plate and the pressure is applied over the entire area. To determine the gain in stiffness obtained with the new design of plate, regular bottom and modified bottom plates of the same weight were subjected to bending tests with the results shown in the table below, from which it is seen that the deflections in plates of the modified bottom were from 20 to 24 per cent less than those in the regular bottom plates for loads ranging from 14,000 to 24,000 lb.

The new form of plate is available in either flat top or crown top, either plain or cambered and in sizes and punchings to meet the requirements of individual roads.

Regular Bottom		Modified Bottom	
Load	Deflection	Load	Deflection
13,000 lb	0.048 in.	13,000 lb	0.048 in.
13,500 lb	0.058 in.	13,500 lb	0.051 in.
14,000 lb	0.068 in.	14,000 lb	0.054 in.
14,500 lb	0.078 in.	14,500 lb	0.057 in.
15,000 lb	0.088 in.	15,000 lb	0.060 in.
15,500 lb	0.101 in.	15,500 lb	0.076 in.
16,000 lb	0.116 in.	16,000 lb	0.090 in.
17,000 lb	0.148 in.	17,000 lb	0.118 in.
18,000 lb	0.180 in.	18,000 lb	0.147 in.
19,000 lb	0.220 in.	19,000 lb	0.175 in.
20,000 lb	0.263 in.	20,000 lb	0.210 in.
21,000 lb	0.313 in.	21,000 lb	0.251 in.
22,000 lb	0.383 in.	22,000 lb	0.291 in.
23,000 lb	0.458 in.		
24,000 lb	0.533 in.	24,000 lb	0.408 in.

An Electric Hand Saw

THE WODACK Electric Tool Corporation, Chicago, has placed on the market an electric hand saw which it is said will cut through a 4-in. by 4-in. timber in less than two seconds and may be used wherever an ordinary lighting circuit or a portable electric generator is available. The saw is fitted with a swivel head for sawing at any angle and also with an adjustable depth gage which permits four inches cutting depth with an 11-in. circular saw, sufficient for cutting 3-in. by 12-in. timbers on a bevel. Either 8-in., 9-in., 10-in., or 11-in. saws may be furnished, although unless otherwise specified each tool is furnished with an 8-in. rip saw and an 11-in. combination saw.



The Wodack Electric Hand Saw

A General Electric universal motor is used, operating on either a.c. or d.c., at 110 volts and 60 cycles or less in case a.c. is used. The saw shaft is mounted on ball bearings with flexible bushings of moulded rubber. The power is turned on by a trigger switch so that operation stops as soon as the operator's hand is removed from the handle, and a removable safety guard is furnished which drops by gravity when the saw is carried, to protect the carrier from injury. An air blower keeps the sawdust removed from ahead of the saw and permits the desired line to be followed. The tool, complete with an 11-in. saw, weighs 24 lb.

With the Associations

Bridge and Building Association

The proceedings of the Richmond convention are now in the hands of the printer and it is expected that they will be ready for distribution to members during the current month.

Wood Preservers' Association

At a meeting of the executive committee at Nashville, Tenn., on January 27, the resignation of William Steen, newly elected director, was received and accepted and Elmer T. Howson, editor, *Railway Engineering and Maintenance*, was appointed to fill the vacancy.

The Maintenance of Way Club

The track laborer of today, where he comes from and how he differs from the man who followed this work 10 years ago, will be the subject of a paper to be presented by R. T. Harding, president of the American Boarding & Supply Company, before the Maintenance of Way Club of Chicago on Thursday evening, February 10, at the Auditorium hotel.

The Engineering Association

Reports from all except two committees have been received by the secretary and are in the process of printing. Reports of five committees were contained in a bulletin which went into the mails on February 1. Another bulletin with five reports is scheduled to follow it within a week and still other bulletins will appear at short intervals.

More than 250 applications have been received by the secretary prior to February 1 for seats at the annual dinner which will be held in the Palmer House, Chicago, on Wednesday evening, March 9. Although the banquet room will seat more than 1,000, it is expected that the demand for tickets will exceed the supply.

Metropolitan Track Supervisors' Club

Fifty-nine members were present at the meeting of the Metropolitan Track Supervisors' Club which was held at the Hotel Martinique, New York, on January 8. Following the usual noonday luncheon, R. L. Haring, supervisor on the Long Island and chairman of the reporting committee, presented a paper on "The Best Method of Safe-Guarding Frog Points by Manganese or Open Hearth Rail," an abstract of which will appear in a later issue.

Owing to conflicting dates of the February and March meetings with the February meeting of the Central Railway Club, Buffalo, and the March convention of the A. R. E. A., Chicago, the next meeting of the club will not be held until April 9.

The Material Market

WITH the placing of orders for 43,000 tons of rails by the Southern Pacific, 21,000 tons by the Nickel Plate, 26,000 by the Chicago, Rock Island & Pacific and 8,000 tons by the Soo Line, the 1927 requirements of the railroads are rather thoroughly covered. In the meantime, small inquiries for small tonnages are coming into the market from time to time. The mills are now actively engaged in rail rolling, but the pressure for deliveries is not as heavy as was anticipated, the most plausible explanation being the heavy snowfall and low temperatures that prevail throughout large sections of the north during January.

While bookings of track accessories have been in smaller volume than was anticipated for the month of January, the market has been active. The Soo Line ordered 8,000 tons of track fastenings and another western railroad 4,000 tons. The Pere Marquette is asking for bids for 2,000 kegs of spikes and 400,000 tie plates. Inquiries for tie plates have also been received from the Nickel Plate, the Wheeling & Lake Erie and the Boston & Maine, the requirements of the last named being 1,300,000.

With the virtual completion of new orders in rails, the mills are looking to the railroads for a large volume of business in their steel requirements for new cars, the total orders for freight cars in January approximating 15,000. That car building comprises a factor in the demand for plates and other structural material is indicated by the fact that one road, the Pennsylvania, has asked bids on 18,000 tons of plates, 7,000 tons of bars and 700 tons of shapes for use in cars. The railroads are also represented in the demand for steel in bridges and buildings. The new Missouri Pacific office building at St. Louis will require 4,000 tons of structural steel, for which contract was recently let.

Taken as a whole, the iron and steel market manifests weakness. As shown in the table below, prices for wire and wire products, cast iron pipe, steel shapes and bars, as well as rivets, are lower than in December. No reductions are recorded for track materials other than for light rails which are not a factor in the steam railroad field. Prices on iron and steel items used in railway tracks and structures are presented below:

Prices Per 100 Lb.

	December				January			
	Pittsburgh		Chicago		Pittsburgh		Chicago	
Track spikes	$2.80 to $3.00	.....	$2.90		$2.80 to $3.00	.....	$2.90	
Track bolts	3.90 to 4.25	.....	3.90		3.90 to 4.25	.....	3.90	
Angle bars	..... 2.75	.....	2.75		..... 2.75	.....	2.75	
Tie plates, steel	..... 2.35	.....	2.35		..... 2.35	.....	2.35	
Boat spikes	..... 3.25	.....	3.25		..... 3.25	.....	3.25	
Plain wire	..... 2.50	.....	2.55		2.45 to 2.50	$2.50 to	2.55	
Wire nails, keg	..... 2.65	.....	2.70		2.60 to 2.65	2.65 to	2.70	
Barb wire, galv.	..... 3.35	.....	3.40		3.30 to 3.35	3.35 to	3.40	
C. I. pipe, 6 in. 12 in., ton	....	46.20 to	47.20		....	43.70 to	45.20	
Plates	..... 1.90	.....	2.10		..... 1.90	.....	2.10	
Shapes	..... 2.00	.....	2.10		1.90 to 2.00	.....	2.10	
Bars, soft steel	..... 2.00	.....	2.10		1.90 to 2.00	.....	2.10	
Rivets, struc	2.40 to 2.60	2.60 to	2.75		2.30 to 2.40	.....	2.60	
Conc. bars, billet	2.00 to 2.10	.....	.....		1.90 to 2.00	.....	.....	
Conc. bars, rail	1.80 to 1.90	1.90 to	2.00		1.80 to 1.90	1.90 to	2.00	
Rails, per gross ton, f.o.b., mills	....	.....	43.00		....	.....	43.00	

Scrap prices have experienced a continued advance in moderate amount and several railroads are offering sizeable tonnages. Scrap prices are quoted below.

Per Gross Ton

	December	January
Relaying rails	$26.00 to $31.00	$26.00 to $31.00
Rails for rerolling	16.00 to 16.50	16.50 to 17.00
Rails less than 3 ft. long	16.25 to 16.75	17.25 to 17.75
Frogs and switches cut apart	14.50 to 15.00	15.00 to 15.50
Steel angle bars	15.00 to 15.50	16.00 to 16.50

Severe winter weather in the north and rains in the south are blamed for the delayed inception of anticipated gains in lumber sales. The buyers, including the railroads, are being accused by the mills of playing a waiting game with the hope of a further depression in prices which are admittedly weak. The Southern pine sales during the first three weeks in January averaged fully 60 per cent greater than during the last two weeks of December, but failed to equal the corresponding sales in January, 1926 and 1925. January sales on the west coast, however did not show any appreciable increase over those for December and were not as large as for corresponding periods of January, 1926 and 1925. Prices of Southern pine are moderately lower than a month ago, while published quotations for Douglas fir, although indicating no reductions from the prices shown for several months past, are said to be subject to material concessions to quantity buyers.

Southern Pine Mill Prices

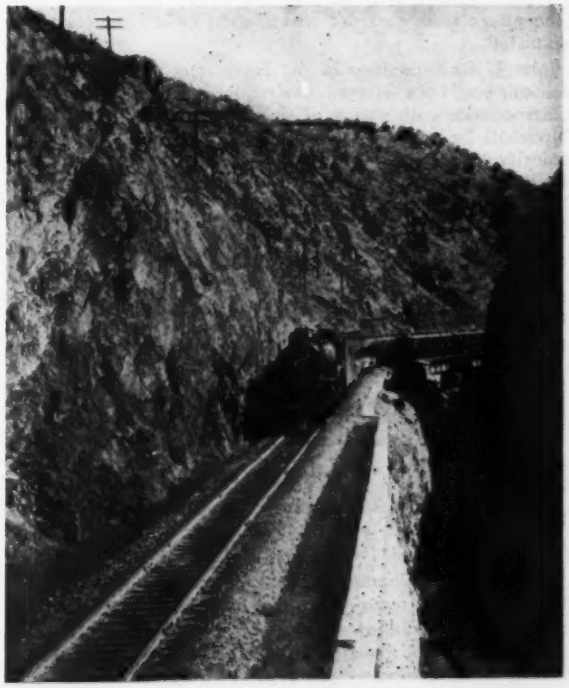
	December	January
Flooring, 1x4, B and B flat	$44.59	$43.96
Boards, 1x8, No. 1	35.88	34.90
Dimension, 2x4, 16, No. 1, common	26.35	26.29
Dimension, 2x10, No. 1, common	28.00	.....
Timbers, 4x4 to 8x8, No. 1	21.57	.....
Timbers, 3x12 to 12x12, rough	.....	.....

Douglas Fir Mill Prices

Floorings, 1x4, No. 2, clear flat	$27.00	$27.00
Boards, 1x8, 6 to 20, No. 1, common	16.00	16.00
Dimension, 2x4, No. 1, common	17.00	17.00
Dimension, 2x10, 16, No. 1, common	17.00	17.00
Timbers, 6x6 to 8x8, No. 1	20.00	20.00
Timbers, 3x12 to 12x12, rough	18.00	18.00

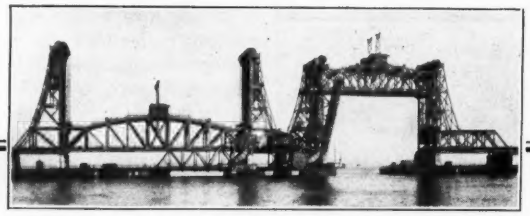
A number of reductions have occurred in the prices of Portland cement during the past month. Of the prices shown in the table below, those for Pittsburgh, Chicago and Cincinnati are five cents lower. The prices given below are per barrel in carload lots, not including package.

New York	$2.15	Minneapolis	$2.22
Pittsburgh	2.04	Denver	2.85
New Orleans	2.40	Dallas	2.05
Chicago	2.05	San Francisco	2.31
Cincinnati	2.32	Montreal	1.15



The Santa Fe's California Limited in the Apache Canyon, New Mexico.

Railway News



Briefly Told

Both houses of Congress have passed the independent offices appropriation bill, which carries appropriations totaling $7,811,314 for the Interstate Commerce Commission, for the fiscal year ending June 30, 1928.

The Senate has confirmed the President's re-appointment of Hywel Davis as a member of the United States Board of Mediation for a five-year term, but rejected the appointment of Cyrus E. Woods as a member of the Interstate Commerce Commission.

The Canadian Pacific and the **Canadian National** have made public their branch-line construction programs for the current year and will ask legislation for their approval from the Canadian Parliament. Most of the construction contemplated is in Alberta and Saskatchewan.

The dividing line between the eastern and central standard time zones have been modified by the Interstate Commerce Commission to include in the eastern zone Cincinnati and Middletown, Ohio, and portions of Ohio, Kentucky and West Virginia. The change will be effective on Sunday, April 3.

Plans are under way for a merger of the Great Northern and the Northen Pacific, which contol jointly, by stock ownership, the Chicago, Burlington & Quincy and the Spokane, Portland & Seattle, according to statements by executives of the two first named roads. The mergers would form a system of 27,000 miles.

The first prize of $50 offered by the Nashville, Chattanooga & St. Louis for the best essay written by its employees on promoting courtesy throughout the company's lines was written by M. D. Rothe, an instrument man in the office of the division engineer at Chattanooga, Tenn. Nine prizes were awarded and a total of 195 papers were submitted.

John J. Esch, member of the Interstate Commerce Commission, has been elected chairman for the current year in accordance with policy of that body that the chairmanship shall be rotated from year to year in the order of seniority of service. Mr. Esch was appointed to the commission in 1921 by President Harding for the term expiring December 31, 1927.

The city council of Vancouver, B. C., has passed a resolution ordering that court proceedings be instituted immediately against the Canadian National for the alleged failure of that company to comply with an agreement entered into in 1913, whereby the city granted the railway about 1,600 acres of land in return for which the company promised to construct a hotel and certain terminal improvements.

John F. Stevens, consulting engineer and formerly chief engineer of the Great Northern and the Chicago, Rock Island & Pacific, was elected president of the American Society of Engineers on January 19. At the same time **George J. Ray,** chief engineer of the Delaware, Lackawanna & Western, was elected a director of District No. 1 and **C. M. Buck,** division engineer of the Atchison, Topeka & Santa Fe, was elected director of District No. 14.

The Interstate Commerce Commission has authorized the Texas & New Orleans to acquire by lease the other lines in Texas and Louisiana controlled by the Southern Pacific, forming a system comprising 4,560 miles of line. While these lines have been unified to a large extent in the past, they have heretofore made separate operating reports to the commission and have had to maintain different organizations in Texas and Louisiana, involving a considerable expense. It is estimated that the saving in printing effected by this lease will amount to between $350,000 and $400,000 per year and that marked reductions can be made in the clerical and accounting forces.

The total quantity of cargo shipped through the Panama Canal during 1926 was 27,586,051 long tons, the largest amount of tonnage for any 12 month period since the Canal was opened for traffic. This was an increase of 16.4 per cent over the tonnage in 1925 and exceeded by 2.2 per cent the previous high record of the fiscal year of 1924.

The Board of Railroad Commissioners of Canada reports that 127 persons were killed and 367 injured at grade crossings of highways and railroads during 1926. The number of crossing accidents was 297, in which 229 automobiles were involved. During the same year 22 passengers were killed and 334 were injured on Canadian railroads.

A new record for length of trains on the Missouri Pacific was established on January 8, when one locomotive hauled a train of 115 cars of coal and two empties from Bush, Ill., to Dupo, a distance of 102 miles, in nine hours. On the same day, another locomotive hauled 201 empties and two loaded cars with a total weight of 7,180 tons, southbound between the same termini.

Revenue car loadings for the week ended January 22 totaled 942,587, a decrease of 7,458 from the preceding week, but an increase of 20,853 and of 18,296 over the corresponding weeks in 1926 and 1925, respectively. The heavy loading of coal was responsible for the increases over the previous years, since almost all other commodities showed either decreases or only slight increases. The cumulative total for the first four weeks was 3,573,780, compared with 3,506,747 and 3,559,581 for the corresponding periods of 1926 and 1925, respectively.

The Texas & Pacific has been authorized by the Interstate Commerce Commission to acquire control by the purchase of capital stock of the Cisco & Northeastern, which extends from a connection with the Texas & Pacific at Cisco, Tex., to Breckenridge, 28.2 miles. The Cisco & Northeastern was recently authorized to construct an extension from Breckenridge to Throckmorton, about 40 miles, and the commission expresses its expectation that this project will be carried out by the new owners. The Texas & Pacific announces that negotiations are practically completed for the purchase of the Abilene & Southern, which extends from Ballinger, Tex., to Hamlin, 96 miles, crossing the Texas & Pacific at Abilene.

The Louisville & Nashville has applied to the Interstate Commerce Commission for authority to build a line from Chevrolet, Ky., to a point near Hagans, Va., 13.87 miles, at an estimated cost of $5,287,000, but asks the commission to suspend the requirement of a connection between its Eastern Kentucky division and the Clinchfield, called the McRoberts line, which was a condition imposed by the commission when it authorized the joint control of the Clinchfield by the L. & N. and the Atlantic Coast line. A proposed report by examiners of the commission recommends that authority be granted for the line for which application is made, but says that while the evidence is not sufficient to overcome the showing that the McRoberts connection is not required, the question cannot be considered in this proceeding, since it would call for a modification of the order in the Clinchfield lease case.

Personal Mention

General

W. J. Whalen, whose promotion to trainmaster on the Chicago, Milwaukee & St. Paul, with headquarters at Montevideo, Minn., was noted in the December issue, was born on March 22, 1893, at Lansing, Iowa. He entered railway service on June 1, 1906, as a water boy on the Chicago, Milwaukee & St. Paul and worked in this capacity during summer vacations until he completed his high school course in 1909. From June 1, 1909, to August 6, 1916, he was employed in various capacities on the same road, being promoted successively to extra gang timekeeper, assistant extra gang foreman, section foreman and extra gang foreman. He was promoted to roadmaster on the Dubuque division on the latter date, and on September 15, 1923, was promoted to trainmaster and roadmaster on the Chicago, Milwaukee & Gary (a subsidiary of the St. Paul), where he remained until his recent promotion to trainmaster on the Hastings and Dakota division.

Franklin Duane, engineer maintenance of way of the Southern division of the Eastern region of the Pennsylvania, with headquarters at Wilmington, Del., has been promoted to assistant to the general superintendent of the same division, with the same headquarters. Mr. Duane was born on September 1, 1862, at Trenton, N. J., and graduated from Princeton university in 1883. He entered railway service on November 24 of the same year as a rodman on the Pennsylvania and was promoted to assistant supervisor on October 1, 1888; to supervisor on December 1, 1894; to assistant engineer on February 14, 1901, and to division engineer on April 8, 1909. On May 1, 1920, he was promoted to engineer maintenance of way of the Southern division, Eastern region, which position he was holding at the time of his recent promotion to assistant to the general superintendent.

Franklin Duane

Engineering

A. C. Harvey, chief engineer of the Nickel Plate and the Lake Erie & Western districts of the New York, Chicago & St. Louis, with headquarters at Cleveland, Ohio, has had his jurisdiction extended over the Clover Leaf district. **F. R. Ramsey,** chief engineer of the Clover Leaf district, with headquarters at Frankfort, Ind., has been appointed district engineer of the same district with the same headquarters. The jurisdiction of **J. C. Wallace,** assistant chief engineer, of **G. H. Tinker,** bridge engineer, and of **F. S. Hales,** engineer of track, all with headquarters at Cleveland, Ohio, have been extended over the Clover Leaf district.

H. Fernstrom, chief engineer of the Virginian, has retired in accordance with the age limit rule of that road. Mr. Fernstrom was born on January 26, 1857, at Orebro, Sweden, and was educated in technical schools in that country. He served during his school vacations from 1873 to 1875 as an apprentice in various departments of railways in Sweden and from 1875 to 1880 was a draftsman and assistant engineer with various engineering firms in the same country. He was a draftsman in an engineer's office in Boston, Mass., from 1880 to 1881 and in the latter year entered railway service in this country as a leveler on the Minneapolis & St. Louis. From 1881 to 1885 he served as leveler, transitman, locating engineer and assistant engineer with various roads in Minnesota. He was appointed chief engineer of the Chicago Great Western in June, 1885, with which road he remained until September, 1900, when he became chief engineer of the St. Joseph & Grand Island (now a part of the Union Pacific System) and the Kansas City & Omaha. He entered the service of the New York Central on April 1, 1901, as principal assistant engineer and later was promoted to assistant chief engineer. He was promoted to chief engineer on February 1, 1903, and served in that capacity until August 1, 1905, when he became chief engineer of the Virginian, with headquarters at Norfolk, Va., which position he held until the time of his recent retirement except for the period during federal control, when he was corporate engineer for the company.

Changes on the Pennsylvania

In order to expedite the handling of the many large improvement projects now under way on the Pennsylvania, a number of important changes have been made in the engineering department, effective February 1. **A. C. Shand,** chief engineer with jurisdiction over the entire Pennsylvania system, has been promoted to assistant to **Vice-President Elisha Lee,** who will have general supervision over the construction of the Pennsylvania's new Philadelphia passenger station project. In his new capacity Mr. Shand will assist in working out the many engineering problems which will be involved in this work. **T. J. Skillman,** chief engineer of the Long Island since July, 1926, has been transferred to the service of the Pennsylvania and appointed chief engineer, succeeding Mr. Shand. **E. B. Temple,** assistant chief engineer of the Eastern region, has been promoted to chief engineer of the Eastern region, **W. D. Wiggins,** assistant chief engineer of the Central region, has been promoted to chief engineer of that region, and **I. W. Geer,** assistant chief engineer of the Western region, has been promoted to chief engineer of the Western region.

A. C. Shand was born on July 1, 1858, at Lesmahagow, Lanarkshire, Scotland, and was educated at Anderson University, Glasgow. He entered railway service in 1879 in connection with location and construction work on the Pennsylvania at Connellsville, Pa., and shortly after was put in charge of the construction of the Torrens shops. From February, 1882, to August, 1884, he was an assistant supervisor and engineer in charge of the location and construction of branches on the Southwest Pennsylvania railway, following which to 1889 he was a supervisor in the Pennsylvania's Altoona yard. In 1889 he was promoted to assistant engineer maintenance of way at Altoona, and on August 1, 1900, he was further promoted to principal assistant engineer of the Pennsylvania Railroad division, following which, in January, 1901, he was made superintendent of the Altoona division, which position he held until June, 1903, when he was promoted to engineer maintenance of way. In April, 1905, he was promoted to assistant chief engineer of the Pennsylvania and on March 1, 1906, to chief engineer of the Pennsylvania's lines east of Pittsburgh and Erie. He held this latter position until March 1, 1920, when he was promoted to chief engineer of the Pennsylvania system,

A. C. Shand

which position he was holding at the time of his recent appointment.

E. B. Temple was born August 28, 1871, at Concordville, Pa., and graduated from Swarthmore College in 1891, immediately following which he entered the service of the Pennsylvania as a rodman. He was engaged in construction work in various capacities until March, 1897, when he was transferred to the drafting department, where, in April, 1900, he was promoted to assistant engineer in charge of that department. On January 1, 1905, he was promoted to assistant to the chief engineer, following which, on March 1, 1906, he was promoted to assistant chief engineer of the Pennsylvania. From June 1, 1918, to March 1, 1920, during the period of federal control, he was engineering assistant to the director of the Allegheny region, and on March 1, 1920, he was appointed assistant chief engineer of the Eastern region, in which capacity he was acting at the time of his recent promotion to chief engineer of the Eastern region.

E. B. Temple

Biographical sketches of the railway careers of T. J. Skillman and W. D. Wiggins appeared in the May, 1926, issue of *Railway Engineering and Maintenance*, page 209, at which time announcement was made of their respective promotions to assistant chief engineer of the Western and Central regions of the Pennsylvania. A similar sketch of the career of I. W. Geer appeared in the October issue of *Railway Engineering and Maintenance*, page 348, when he was promoted to assistant chief engineer of the Western region of the Pennsylvania.

Raymond Swenck, division engineer of the Pittsburgh division, with headquarters at Pittsburgh, Pa., has been promoted to engineer maintenance of way of the Southern division, Eastern region, with headquarters at Wilmington, Del., succeeding **Franklin Duane**, whose promotion to assistant to the general superintendent is noted elsewhere in this issue. **L. B. Young**, assistant division engineer of the Columbus division, with headquarters at Columbus, Ohio, has been promoted to division engineer of the Monongahela division, with headquarters at Uniontown, Pa., where he replaces **W. S. Johns, Jr.**, who has been transferred to the St. Louis division, with headquarters at Terre Haute, Ind., to succeed **W. H. Brown**, who has been acting division engineer. **R. W. E. Bowler**, division engineer of the Toledo division, with headquarters at Toledo, Ohio, has been transferred to the Pittsburgh division to succeed Mr. Swenck. He was succeeded at Toledo by **J. K. Sherman**, who was transferred from Ft. Wayne, Ind. **J. L. Gressitt**, supervisor, with headquarters at Johnstown, Pa., has been promoted to division engineer at Ft. Wayne to succeed Mr. Sherman. **F. M. Hawthorne**, acting division superintendent of the St. Louis division, with headquarters at Terre Haute, Ind., and formerly division engineer of the same division, has been transferred to Cleveland, Ohio, as division engineer of the Cleveland & Pittsburgh division. **J. M. Fair**, supervisor on the Philadelphia Terminal division, with headquarters at West Philadelphia, Pa., has been promoted to division engineer of the same division, with headquarters at Philadelphia.

H. E. Perkins, whose promotion to assistant division engineer on the Baltimore & Ohio, with headquarters at Wheeling, W. Va., was noted in the January issue, was born on May 29, 1892, at Sagamore, Mass., and was educated at Lehigh University. He entered railway service on October 28, 1916, as a rodman on the B. & O. at Pittsburgh and in 1917 was promoted to assistant supervisor on standard track work efficiency, with headquarters at Gaithersburg, Md. He was promoted to assistant engineer in charge of an engineering corps on the Connellsville division in 1919 and was transferred to the Pittburgh division, with headquarters at Pittsburgh, Pa., in 1922, which position he was holding at the time of his recent promotion to assistant division engineer.

A. M. Traugott, assistant chief engineer of the Virginian, has been promoted to chief engineer to succeed **H. Fernstrom**, who has retired, and the position of assistant chief engineer has been abolished. Mr. Traugott was born on July 31, 1882, at Rochester, N. Y., and was educated at Purdue University. He entered railway service during his vacation periods at college as a chainman on the Buffalo, Rochester & Pittsburgh and later served as a rodman on the Delaware, Lackawanna & Western. He entered the service of the Virginian as a rodman in February, 1903, with which road he has been connected continuously since that time. He was promoted successively to draftsman, instrumentman, resident engineer on construction, and later to locating engineer. He was appointed resident engineer of the Norfolk division in February, 1913, and one year later was promoted to division engineer of the Third and Deepwater divisions. He was promoted to acting chief engineer in May, 1919, during federal control and on the return of the road to its owners in March, 1920, was appointed assistant chief engineer, which position he was holding at the time of his recent promotion to chief engineer.

A. M. Traugott

A. A. Matthews, whose appointment as chief engineer of the Denver & Salt Lake, with headquarters at Denver, Colo., was noted in the December issue, was born on November 9, 1876, at Tremont, Ill., and was educated at the Colorado State School of Mines. He entered railway service as a chainman on the Union Pacific in July, 1896 and later served as a levelman and transitman on other western roads. He was appointed principal assistant engineer on the Colorado & Southern in July, 1901, with which road he remained until 1911, with the exception of nine months in 1907 and 1908 when he was in charge of construction on the Caliente & Pioche, now a part of the Los Angeles & Salt Lake. He was assistant general manager of the Texas Central (now a part of the Missouri-Kansas-Texas) from July, 1911, to November, 1912, when he entered the service of the M.-K.-T. as superintendent, later being promoted to engineer maintenance of way. He was chief engineer of the St. Louis Southwestern from January, 1918, to May, 1921, except during federal control when he was assistant chief engineer of a group of roads at Dallas, Tex. In May, 1921, he was appointed secretary and general manager of the Western Concrete Products

A. A. Matthews

Company at Denver, Colo., which position he was holding at the time of his recent appointment as chief engineer of the Denver & Salt Lake.

F. H. Cothran, formerly vice-president of the Quebec Development Company, and in charge of construction on the Saguenay river projects, has been appointed chief engineer of the Piedmont & Northern, with headquarters at Charlotte, N. C.

Richard Brooke, special engineer in the office of the vice-president of operation of the Chesapeake & Ohio, with headquarters at Richmond, Va., has been promoted to assistant engineer maintenance of way, with the same headquarters. Mr. Brooke was born at Sutherlin, Va., and was educated at the Virginia Military Institute, from which he graduated in 1908. He entered railway service on April 18, 1909, as a rodman on the Cumberland division of the Baltimore & Ohio and was transferred successively to the New Castle and Pittsburgh divisions. He was promoted to transitman on the latter division on March 6, 1911, to draftsman on August 21, 1911, and to assistant division engineer on June 6, 1912. He served as assistant engineer on the Main Line division from February 2, 1916, to January 30, 1917, and was transferred to the office of the engineer maintenance of way on the latter date. Mr. Brooke entered the United States army on June 20, 1917, as captain in the Fifteenth Engineers, and was promoted to major on November 6, 1918. He left the army on August 30, 1919, and re-entered railway service with the Baltimore & Ohio as division engineer of the Charleston division. He left the B. & O. on April 15, 1925, to make a study and submit a report on the railway and port facilities of the Anglo-Chilean Nitrate Consolidated Corporation in South America. On the completion of this work on December 15, 1925, he entered the service of the Chesapeake & Ohio as special engineer in the office of the vice-president of operation, which position he was holding at the time of his recent promotion to assistant engineer maintenance of way.

Richard Brooke

Track

Stanley G. Phillips has been appointed supervisor on the Lehigh Valley, with headquarters at Hazelton, Pa.

H. Ferguson, superintendent of track on the Southern Ontario division of the Canadian National, with headquarters at Toronto, Ont., has retired under the pension regulations of the company.

Calvin Harkins has been appointed district roadmaster on the Fourth district, Butte division, with headquarters at Great Falls, Mont., succeeding J. Wallin, who has been granted a leave of absence.

R. C. Milton, engineering accountant on second track construction on the Chicago, Burlington & Quincy, has been promoted to assistant roadmaster on the Chicago division, with headquarters at Chicago.

A. M. Anderson has been promoted to roadmaster on the Chicago, Milwaukee & St. Paul, with headquarters at Ellensburg, Wash., succeeding **H. C. Davis,** and **R. A. Lambert** has been promoted to roadmaster, with headquarters at Cedar Falls, Wash., succeeding **R. H. Stetson.**

S. McCarthy, section foreman on the Northern Pacific, has been promoted to roadmaster, with headquarters at East Grand Forks, Minn., succeeding **P. J. Carney,** who has been granted a leave of absence on account of sickness. **Addison Howland,** roadmaster, with headquarters at Little Falls, Minn., has been transferred to Fargo, N. D., to replace **C. H. Burgess,** who has been transferred to Glendive, Mont., to replace **W. P. Murn,** deceased.

G. M. Luther, whose promotion to roadmaster on the Missouri-Kansas-Texas, with headquarters at Wichita Falls, Tex., was noted in the December issue, entered railway service as a rodman on the Missouri-Kansas-Texas in January, 1916, and was promoted to concrete inspector in August of the same year. He was promoted to instrument man in January, 1917, and in May, 1918, entered the 66th regiment of railway engineers, serving in this country and in France until his discharge in June, 1919, when he resumed his former position with the M.-K.-T. He was promoted to assistant engineer in March, 1920, which position he was holding at the time of his recent promotion to roadmaster.

Jesse R. Philips, whose promotion to supervisor on the Pere Marquette was published in the December issue, was born on August 11, 1885, at Howard City, Mich., and entered railway service as a section laborer on the Pere Marquette, working in this capacity during the summer months. During 1906 and 1907 he was an extra gang laborer on the Grand Rapids & Indiana (now a part of the Pennsylvania). He returned to the Pere Marquette in April, 1909, as a section laborer at Belding, Mich., and on April 15, 1909, was promoted to section foreman at Gowen, Mich. He was transferred successively to Mosely, Mich., and to Alma. In 1922 he was promoted to extra gang foreman, acting in this capacity during the summer months and as section foreman during the winter until his recent promotion to supervisor.

Luman M. Harsha, whose promotion to roadmaster on the St. Louis-San Francisco, with headquarters at Hugo, Okla., was noted in the January issue, was born on July 9, 1890, at Shawneetown, Ill., and graduated from the University of Kansas in 1914. He entered railway service in July of the same year as a rodman on the St. Louis-San Francisco, being promoted to instrumentman in August, 1915, and to assistant engineer in December, 1917. Mr. Harsha served in the 210th Engineers of the United States army from July, 1918, to February, 1919, when he returned to the Frisco as a rail inspector and instrumentman, serving in this capacity until March, 1920, when he was promoted to assistant engineer. He became a draftsman in April, 1921, which position he was holding at the time of his recent promotion to roadmaster.

B. H. Bryant, whose promotion to roadmaster on the Chicago, Rock Island & Pacific was noted in the December issue, was born on March 31, 1889, at Greensburg, Kan., and entered railway service as a section laborer on the Rock Island at Mineola, Kan., working in this capacity and as relief foreman during parts of 1906 and 1907. He again entered the service of the Rock Island on June 11, 1911, as an apprentice foreman at Dalhart, Texas, and since that time has been connected with that road. He was promoted to section foreman on July 1, 1912 and to division motor car inspector, with headquarters at Liberal, Kan., in February, 1919. This position was abolished in 1920 and he became an extra gang foreman. He was again promoted to motor car inspector in September, 1920, with headquarters at Dalhart, Texas, which position he was holding at the time of his recent promotion to roadmaster, with headquarters at Amarillo, Texas, which were afterwards changed to McLean, Texas.

J. A. Otto, assistant supervisor on the Baltimore division of the Pennsylvania, with headquarters at Washington, D. C., has been promoted to supervisor, with headquarters at Hollidaysburg, Pa., succeeding **C. A. Pfalzgraff,** who has been transferred to Irvona, Pa., where he replaced **W. S. Reitz,** who has been transferred to Sunbury, Pa., in the place of **F. H. Lewis,** transferred to Columbia, Pa. **R. P. Graham,** supervisor at Lemoyne, Pa., has been transferred to the Philadelphia terminal division to replace **J. M. Fair,** whose promotion to division engineer is noted elsewhere in this issue, and was succeeded at Lemoyne by **J. F. Swen-**

son, who has been transferred from Erie, Pa. **Norman Moore,** assistant on engineer corps on the Chicago Terminal division, has been promoted to assistant supervisor, with headquarter at Parkton, Md., where he succeeded **G. H. Ricedorf,** who has been transferred to Washington, D. C., to replace Mr. Otto. **J. C. Oxley,** assistant on engineer corps on the Cleveland & Pittsburgh division, has been promoted to assistant supervisor on the Monogahela division with headquarters at Monongahela City, Pa. The following assistants on engineer corps on the Western region have been promoted. **J. S. Gillum,** from the Columbus division, to assistant supervisor on the Middle division, Eastern region, with headquarters at Altoona, Pa.; **B. W. Tyler,** from the St. Louis division, to assistant supervisor on the Trenton division, Eastern region, with headquarters at Bordenton, N. J.; **E. M. Arndt,** from the Indianapolis division, to assistant supervisor on the Maryland division, Eastern region, with headquarters at Perryville, Md.; **P. E. Feucht,** from the Indianapolis division, to assistant supervisor on the Philadelphia Terminal division, with headquarters at Philadelphia, Pa.; **W. S. Riser,** from the Indianapolis division, to assistant supervisor on the Cincinnati division, with headquarters at Morrow, Ohio, and **W. W. Clarke,** from the Logansport division, to assistant supervisor on the Indianapolis division, with headquarters at Columbus, Ind.

Bridges and Buildings

R. E. Nichols, chief carpenter on the Sioux City and Dakota division of the Chicago, Milwaukee & St. Paul, has had his headquarters changed from Elk Point, S. D., to Sioux City, Iowa.

P. F. Thomas, of the engineering department of the Chicago, Burlington & Quincy, with headquarters at Lincoln, Neb., has been promoted to master carpenter and water service foreman on the Sheridan division, with headquarters at Sheridan, Wyo.

Purchasing and Stores

Walter E. Evans, assistant to the general purchasing agent of the Canadian National, with headquarters at Montreal, Que., has been promoted to purchasing agent of the Grand Trunk Western, with headquarters at Detroit, Mich., where he succeeds **George W. Caye,** who retired on January 1, after a service of more than 44 years with the Canadian National and its subsidiaries.

R. L. Tindal, whose promotion to purchasing agent of the New York, Chicago & St. Louis, with headquarters at Cleveland, Ohio, was noted in the January issue, was born at Ogdensburg, N. Y., on July 15, 1889, and entered railway service on February 1, 1912, in the mechanical department of the New York, Chicago & St. Louis. He was promoted to chief clerk to the master car builder on March 1, 1917, and to chief clerk to the superintendent of motive power on January 1, 1919. On September 1, 1923, he was promoted to chief clerk to the vice-president and general manager, which position he held until his promotion to purchasing agent for the Nickel Plate and Lake Erie and Western districts on December 1, 1926. His jurisdiction was extended to include also the Clover Leaf district on January 1, 1927.

G. D. Tombs, assistant storekeeper of the Vicksburg Route of the Yazoo & Mississippi Valley, with headquarters at Vicksburg, Miss., has been promoted to division storekeeper of the Mississippi division of the Illinois Central, with headquarters at Water Valley, Miss., succeeding **G. F. Ohden,** who has been transferred to the Indiana division, with headquarters at Mattoon, Ill., where he takes the place of **R. J. Gable,** who has been transferred to the Springfield division, with headquarters at Clinton, Ill. **J. W. Cockrill,** storekeeper of the Springfield division at Clinton, Ill., has been transferred to Centralia, Ill., to succeed **A. E. Walters,** who has been transferred to the Memphis division of the Yazoo & Mississippi Valley, with headquarters at Memphis, Tenn., succeeding **G. W. Rice,** resigned.

Construction News

The Atlantic Coast Line has let contracts to the Cornell-Young Company of Macon, Ga., and to Sutton Brothers of Jacksonville, Fla., for the construction of 16 miles of railroad from Thonotosassa, Fla., to Richland. The route is being built to eliminate the necessity of traveling by way of Lakeland over the west coast route into Tampa and will shorten the route about 50 miles.

The Baltimore & Ohio has awarded a contract to Frainie Bros. & Haigley, Baltimore, Md., for the construction of an extension to its roundhouse at Willard, Ohio, to cost approximately $35,000. A contract has been awarded to the Krebay Construction Company, Indianapolis, Ind., for the construction of a new freight house and driveway on the Cincinnati, Indianapolis & Western, at Indianapolis, Ind., estimated to cost about $38,000. A contract has been awarded to the Empire Construction Company of Baltimore for grading and masonry work on second track from Dickerson to Point of Rocks, Md., to cost about $200,000.

The Boston & Maine will soon start the construction of a new fruit auction terminal at Rutherford Avenue, Boston. Plans call for a modern fireproof structure 600 ft. long and 90 ft. wide to cost about $350,000 and to be completed about July 1.

The Canadian Pacific will construct new engine terminal and shop facilities at Toronto, Ont., to cost approximately $3,000,000.

The Chicago, Burlington & Quincy has awarded a contract for the construction of a three-story passenger station and office building at Lincoln, Neb., to Peter Kiewits Sons, Omaha, Neb. The total expenditure involved in the construction of the building, including rearrangement of track facilities, is about $950,000. Besides this company, the Union Pacific will use the station as a tenant. The operating, engineering and mechanical forces now located at Lincoln will be housed in the office building. The Ft. Worth & Denver South Plains, a subsidiary of the Burlington, has awarded contracts for the construction of a line between Estelline, Tex., and Plainview, 202 miles, to Peterson, Shirley & Gunther, Omaha, Neb., and to Sprague Nicely, Beatrice, Neb. Construction of this extension, which joins the Ft. Worth & Denver City at Estelline and includes branch lines to Silverton, Tex., and Lubbock, is expected to cost about $6,300,000.

The Chicago, Indianapolis & Louisville has authorized the construction of a locomotive repair shop at Lafayette, Ind., estimated to cost about $275,000.

The Chicago, Milwaukee & St. Paul has been authorized by the Federal Court at Chicago to expend $275,000 at the Gallatin Gateway entrance to Yellowstone Park, including the construction of a combined hotel and station at Salesville, Mont., to be known as Gallatin Gateway, at a cost of $200,000, and the rehabilitation of the line from Three Forks, Mont., to Gallatin Gateway at a cost of $75,000, to eliminate travel by motor coach between these points. Construction is to be completed by June 1. Authority has also been given to drill a soft water well and to construct a 12-ft. by 24-ft. pump house, including pump and piping, at Lavina, Mont., and to construct a hot water washout plant to serve a 35-stall roundhouse in Chicago at a total cost of $53,400.

The Delaware, Lackawanna & Western has asked for bids for the construction of a steel, vertical lift bridge to be erected over the Hackensack River in the Jersey meadows, between Hoboken and Newark, 65 feet south of the present bridge. This project, including the changes in track elevation incident thereto, will cost about $3,000,000.

The Denver & Rio Grande Western is preparing plans for a water treating plant at Pueblo, Colo., to cost approximately $50,000.

The Grand Trunk Western is receiving bids until February 4 for the construction of a rectangular enginehouse 52 ft. by 160 ft., at Harvey, Ill.

The Manitoba & Northwestern has applied to the Canadian Parliament for permission to construct a line from Theodore, Sask., westerly and southwesterly to Duval, about 100 miles.

The Missouri Pacific has been authorized to construct a branch line from a connection with its main line at Tioga, La., in a southeasterly direction for 3.9 miles. The main purpose of the extension is to serve the military camp, Camp Beauregard, at the southeast end of the new line. A contract has been let to Winston Brothers Company, St. Louis, Mo., for the grading and bridging for three additional units of second track between St. Louis, Mo., and Jefferson City. The estimated cost of the work, $3,425,000, covers the territory from Labaddie, Mo., to Washington, 9.4 miles; from 3 miles east of Hermann, Mo., to a point 1.4 miles west of Gasconade, 11.4 miles, and from Isbell, Mo., to Osage, 8 miles. Authorization has been made for the enlargement of the roundhouse and improvement of roundhouse facilities at Memphis, Tenn., at an estimated cost of $13,000, while additional trackage and team track facilities will be constructed at the Georgia and Calhoun Avenue freight yards and at the Sargent yard at a cost of about $39,500. This company also contemplates the construction of a bridge across the Mississippi River near St. Louis within the next four years at an estimated cost of $9,000,000. A contract for the construction of a locomotive repair shop, 112 ft. by 81 ft., at Harlingen, Texas, has been awarded to the Hubbard Construction Company, Houston, Texas. Total expenditures for repair facilities and improvements at this point are expected to approximate $400,000.

The New York Central has awarded a contract to Stevenson & Cameron, Inc., New York, for work in connection with the construction of an automatic substation at Harmon, N. Y., at an approximate cost of $55,000. A contract has been awarded to H. R. Beebe, Inc., Utica, N. Y., for work in connection with a bridge over Pocantico Creek, Philipse Manor, N. Y., to cost approximately $35,000. A contract for the replacement of roofs on power houses and switch houses at Glenwood, N. Y., and Port Morris, to cost approximately $35,000, has been awarded to Klein & Kavanagh, New York. To the McHarg-Barton Company, New York, has been awarded a contract in connection with the construction of duct lines and splicing chambers between Spuyten Duyvil and Marble Hill, N. Y.; estimated cost, $165,000. A contract has been awarded to the Edward J. Duffy Company, Inc., Weehawken, N. J., in connection with the extension of a substation at White Plains, N. Y., at an estimated cost of $30,000. The Public Service Commission of New York has ordered the elimination of 25 highway grade crossings in the city of Fulton, Oswego County, 24 miles north of Syracuse; some of which are on the New York Central and some on the New York, Ontario & Western.

The Pennsylvania has awarded a contract to the Jump Housewrecking Company, Philadelphia, for the removal of the old two-story brick Pullman building at Thirty-second and Market Streets, that city, in connection with its terminal improvement program at that point. A contract has been awarded to the United Dredging Company, Atlantic City, N. J., for dredging at Cold Spring Harbor, N. J., to cost approximately $31,000. Contracts have been awarded to the Electro Construction Company, Philadelphia, for electric wiring for its new tank shop at Altoona, Pa., to cost approximately $31,000; to P. T. Clifford & Son, Valparaiso, Ind., for grading, masonry and track work for a new yard at McCollough, Ohio, at an approximate cost of $160,000; to the George A. Fuller Company, New York, for an extension to the commissary building at Sunnyside yard, Long Island City, N. Y., at an approximate cost of $200,000; and to the John F. Casey Company, Philadelphia, for the construction of coal handling facilities at Sodus Point, N. Y., to cost approximately $300,000. A contract has been let by this road to Brann, Stuart Company of Philadelphia, for reconstruction of a bridge over the Delaware and Raritan Canal at New Brunswick, N. J., to cost about $50,000. The road has let a contract to the Newhall Company of Cleveland for construction of coaling and water facilities and additional sidings at East Rochester, Ohio, to cost about $160,000. Extensive improvements have been commenced at Conemaugh, Pa., the construction of which necessitates the shifting of a stretch of the Conemaugh River from its natural bed to an entirely new channel. The new facilities consist of a mechanically operated, 250-ton capacity coaling station, spanning nine tracks, with extensive trackage additions to permit the engines of 100-car freight trains to take coal and have their fires cleaned while clear of the main tracks.

The St. Louis, Troy & Eastern has awarded a general contract for the construction of an elevated structural steel approach, 7,400 ft. long, to the McKinley bridge at Venice, Ill., to the Fruin-Colnon Contracting Company, St. Louis, Mo. The project, which will cost approximately $1,000,000, will enable this railroad to eliminate a number of grade crossings in reaching the McKinley bridge.

The Reading, through its subsidiary, the Atlantic City, is planning new terminal and station facilities for Atlantic City, N. J., involving a new passenger station, new passenger and freight yards and the widening of streets in the vicinity, to cost approximately $4,000,000. The passenger terminal provides for 10 tracks, each to hold a train of 14 coaches and engine. All tracks will have concrete platforms and butterfly train sheds.

The St. Louis-San Francisco has awarded a contract for the grading and bridging on its new line between Aliceville, Ala., and Demopolis to the A. G. Kershaw Contracting Company, Birmingham, Ala., and a similar contract for the line between Demopolis and Kimbrough, Ala., to John A. Kries & Son, Knoxville, Tenn. Second track including 4 miles from Harvard, Ark., south, 2½ miles between Memphis, Tenn., and Yale, and 5 miles between Springfield, Mo., and Mulroy, have been authorized for construction this year at a cost of $378,000. Improvement and enlargement of freight yards at Yale, Tenn., Birmingham, Ala., and West Tulsa, Okla., have been planned, with an expenditure of $1,750,000. New mechanical facilities will be added at Yale at a cost of $100,000. Authorization has been made for the construction of a $75,000 passenger station at Pittsburg, Kan., a $54,000 station at Holly Springs, Miss., and an $18,000 station at Boynton, Okla. Other improvements in the budget include $63,500 for new coaling stations, $102,000 for water stations, $61,360 for changes in grade and alinement and $982,000 for improvement of bridges and trestles. A contract for the construction of a brick passenger and freight station at Boynton, Okla., estimated to cost $15,000, has been awarded to J. H. Reddick, Ft. Smith, Ark.

The Southern is reported to have prepared plans for yard extensions at Durham, N. C., to cost in the neighborhood of $100,000.

The Southern Pacific has awarded a contract to Currie & Dulgar for the construction of a reinforced concrete warehouse at Bakersfield, Calif., at a cost of about $41,000. A total expenditure of approximately $187,000 will be made for improvements at this point.

The Toledo Terminal plans for the construction of a three-track bridge over the Maumee River at Toledo, Ohio, have been approved by the Toledo Port Commission, which has directed engineers of the railroad to cooperate with the city engineers in the development of a double-deck bridge, one deck to handle street traffic. The cost of the project is estimated at more than $1,000,000.

The Virginian plans to increase its track storage capacity at Sewalls Point, Va., within the coming year to accommodate approximately 500 additional cars. It also expects to spend more than $1,000,000 in improvements on other parts of this line in Virginia and West Virginia. Most of this work will be in the nature of providing additional tracks and increasing the length of passing tracks.

The Virginian & Western has applied to the Interstate Commerce Commission for a certificate authorizing the construction of an extension of the Guyandot River branch of the Virginian from a point near Itmann, W. Va., to a connection with the Chesapeake & Ohio at or near Gilbert, W. Va., 40.6 miles.

Supply Trade News

General

The Air Reduction Company, Inc., has acquired the plants and business of the Commercial Acetylene Supply Company, Inc., through a long term lease. The manufacturing plants acquired are located at Berkeley, Cal., and Los Angeles.

The Worthington Pump & Machinery Corporation, New York, has bought the **Harris Air Pump Company** of Indianapolis, Ind., manufacturer of air lift systems and air lift pumps. The purchase included patents, drawings, patterns and good-will of the latter company.

The Magor Car Corporation, 30 Church Street, New York, has opened an office at 133 West Washington Street, Chicago, to handle railway sales in Illinois, Michigan and Minnesota, the office having been placed in charge of W. P. Meigs.

J. F. Prettyman & Sons are building a creosoting plant at Charleston, S. C., which will have a capacity for treating 55,000,000 board feet of timber annually, and provide storage space for 1,100,000 ties in addition to a large area for the storage and seasoning of piles, poles and other timbers. This plant, which was designed and is being constructed under the supervision of Grant B. Shipley, engineer, Pittsburgh, Pa., will cover an area of about 47 acres and will be served by a 500-ft. wharf along the Ashley River, as well as by direct rail connections with the Atlantic Coast Line, the Seaboard Air Line and the Southern.

Personal

O'Neill Ryan, Jr., advertising manager of the Celotex Company, Chicago, has been promoted to assistant general sales manager in charge of sales promotion, and has been succeeded by **Edwin Cox.**

H. M. Sloan, vice-president and treasurer of the Buda Company, Harvey, Ill., has been placed in charge of all sales activities of the company, and has been succeeded as treasurer by **J. S. Dempsey.**

Simeon Hodgin, formerly division engineer of the Richmond division of the Pennsylvania, with headquarters at Richmond, Ind., has been made vice-president of the Hayes Track Appliance Company, Richmond, Ind. Mr. Hodgin was born in Richmond and graduated from Purdue University in 1899. He entered railway service in June of the same year as an assistant in an engineering corps on the Pennsylvania at Pittsburgh, Pa., and served in that capacity until January, 1903, when he was promoted to assistant engineer, being located successively at Cambridge, Ohio, Louisville, Ky., Chicago and Pittsburgh. He was promoted to division engineer, with headquarters at Cambridge, Ohio, in July, 1908, and in 1913 was transferred to Richmond, Ind., which position he held until his recent election as vice-president of the Hayes Track Appliance Company.

Simeon Hodgin

N. E. Brooks has been appointed a representative in the railway sales division of the Oliver Ames & Sons Corporation, a subsidiary of the Ames Tool & Shovel Company, with headquarters at 41 Park Row, New York. Mr. Brooks is a graduate of the Massachusetts Institute of Technology and has served for 15 years in railway sales work.

Frederick Hackmann, president of the Hackmann Railway Supply Company, Chicago, died in that city on January 17 after a severe illness following a long period of poor health. Mr. Hackmann was born in Schleswig-Holstein, Germany, in 1872, and was educated at technical schools in Schleswig. Coming to America at the age of 18 he entered railway service as a track laborer, following which he was employed for a number of years in railway track maintenance. Through a natural bent for the development of mechanical appliances, his interests led him into the development field and he was engaged for many years in the invention and perfection of various appliances used by the railroads. For a period of about three years he was in the personal employ of the late James J. Hill and during the World War he was employed by the government on special investigations concerning the casting of shell casings. Following the close of the war he turned his attention to track appliances, with the result that he developed the Idol track liner, the first of a considerable number of appliances designed for lining track which are now in general use. For the purpose of marketing his track liner and other track appliances, he organized the Hackmann Railway Supply Company in 1922, of which he was president until the time of his death.

Frederick Hackmann

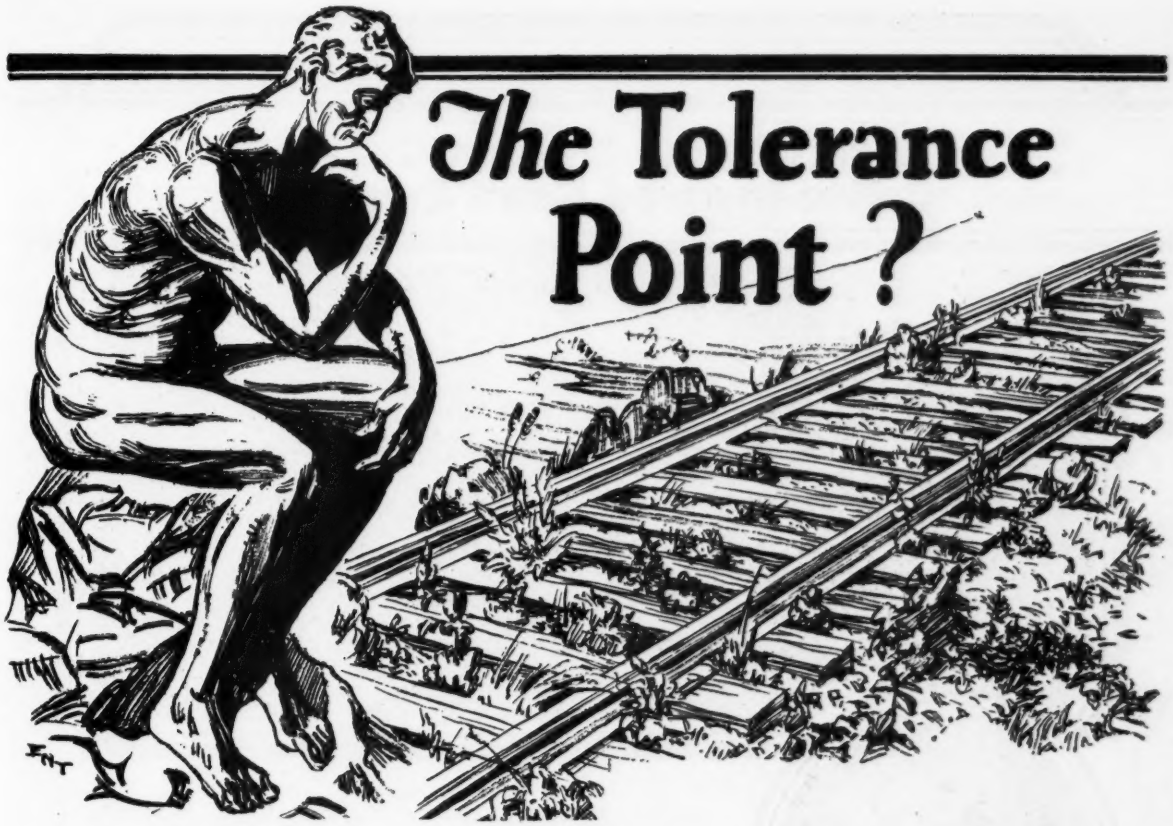
Trade Publications

Sheet Steel Cornices.—The Sheet Steel Trade Committee has recently issued a complete set of standard specifications for the fabrication and setting of sheet steel cornices for various types of building construction. These specifications, which are published in the form recommended by the American Institute of Architects, form a 12-page booklet in a standard filing folder.

Smokeless Heating Equipment.—In a 24-page bulletin, No. 54, issued by the Aeroil Burner Co., Inc., Union City, N. J., is described and illustrated the oil burning heating equipment of this company for melting and heating asphalt, tar and other bituminous products in connection with roofing, water proofing, insulating, flooring, and road and paving work.

Hydraulic Dredging Machinery and Pumps.—The Morris Machine Works, Baldwinsville, New York, has recently issued a 56-page catalog describing and illustrating its dredging machinery and equipment and also its complete line of general and heavy duty centrifugal pumps. In addition, the catalog contains a discussion on hydraulic dredging, sand and gravel production, and the use of power equipment and accessories for this class of work.

Portable Air Compressors. In bulletin No. 83D, the Sullivan Machinery Company presents a description of its portable air compressors WK 312, 314, 32 and 24, having capacities ranging from 110 to 320 cu. ft. of free air per minute. In conformity to the style of previous bulletins issued by this company, the matter is presented in the form of a descriptive article with numerous illustrations of the complete equipment and their various parts as well as photographs showing them in actual use. Topical side and center headings add to the clearness of the treatment.



A Problem in Chemical Weed Killing

Engineers would not undertake important construction work without careful study of strength and safety factors, yet hundreds of thousands of dollars are spent on chemical weed killers without a similar consideration of the problems involved.

Plants will tolerate only a limited amount of destructive chemical. This amount should be applied, plus the safety factor, and any further excess will necessarily be wasted. The use of a distributing apparatus of absolutely uniform performance makes it possible to greatly reduce the necessary safety factor.

A new Chipman Spray Apparatus will be available this season that will evenly distribute chemical regardless of the speed of the train. It will be geared-to-the-track and automatically regulate the pressure and speed of discharge. This apparatus will give definitely uniform results with a great saving of material.

This apparatus will be used on Atlas service work and our advisory service is prepared to adapt railroad owned apparatus to this principle.

Descriptive matter on this subject is available

CHIPMAN CHEMICAL ENGINEERING CO., INC.

BOUND BROOK, N. J.

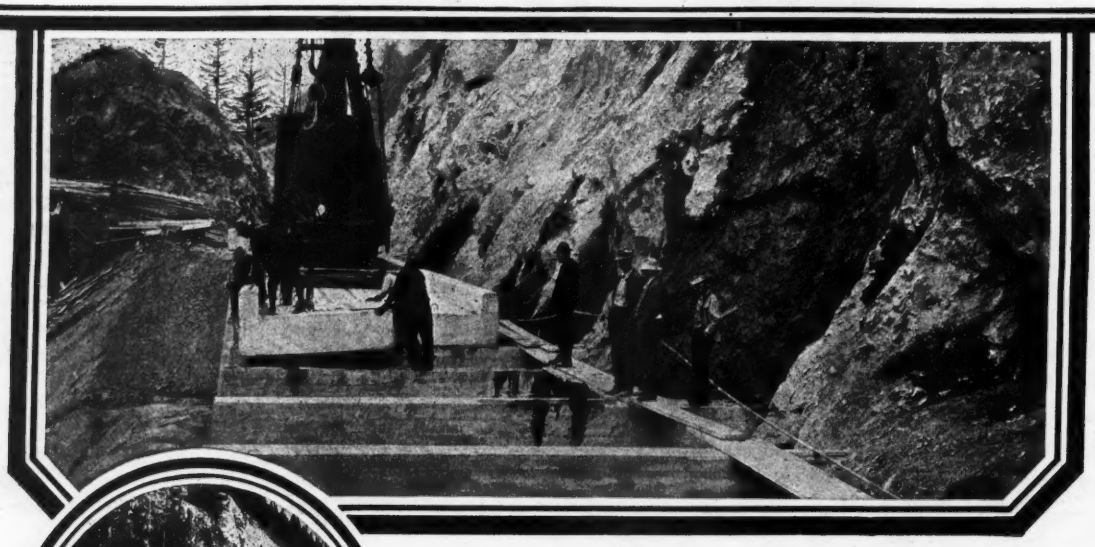
Factories

Bound Brook, N. J. **Clearing, Ill.** **Palo Alto, Cal.** **Houston, Tex.**

[*The Chipman Chemical Engineering Co., Inc., is sole licensee for Non-Poisonous Weed Killer under United States Patent No. 1,534,289.*]

ATLAS NON-POISONOUS WEED KILLER SERVICE

Through the Natron Cut-Off Celite Insured Good Concrete



CELITE is a finely ground mineral powder composed of practically pure amorphous silica.

It is added to a concrete mixture with the other dry materials at the mixer, in quantities averaging three or four per cent of the portland cement content depending on the mix and the character of the aggregates.

The advantages of using Celite in a concrete mixture are to increase its workability without the use of excess mixing water, to prevent segregation, to insure uniformity, and water-tightness and to improve the finish and the quality of the final concrete.

IN ITS COURSE between Oakridge and Kirk, Oregon, the Natron cut-off of the Southern Pacific R. R. traverses thirty-six miles of rugged mountain country. It runs through nineteen tunnels and crosses many bridges, viaducts and culverts, which, in all, required 46,000 cubic yards of concrete for their construction.

The admixture Celite was used in every yard of this concrete to insure workability, freedom from segregation and a higher uniform strength. Watertight concrete was secured which will resist for years the destructive action of the elements.

The large view above shows the placing of one of the large precast concrete slabs used on bridge construction on this project, while several of the bridges appear in the small picture at the left. In the latter view, a rough wagon road can be faintly seen winding its way above the line of the railroad.

Some idea of the difficulties overcome in building this project can be secured by realizing that all materials for construction had to be hauled in over this difficult mountain road. The building of the wagon road was in itself a tremendous task, costing the railroad several million dollars.

CELITE

Insures Better Concrete at Less Cost

Our Bulletin S-325 describes the use of Celite for all types of concrete construction. If you have not received a copy you will find this of interest. Write our nearest Division office.

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CELITE PRODUCTS CORPORATION
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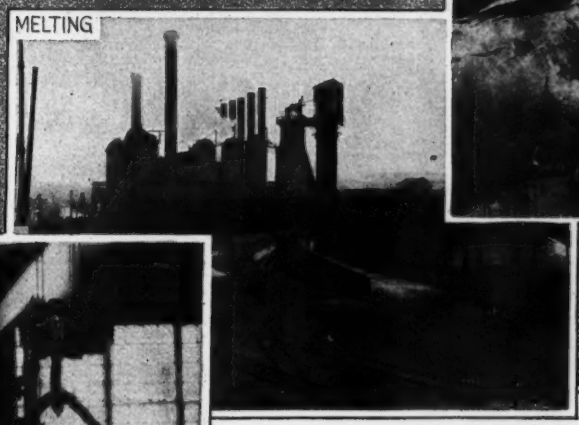
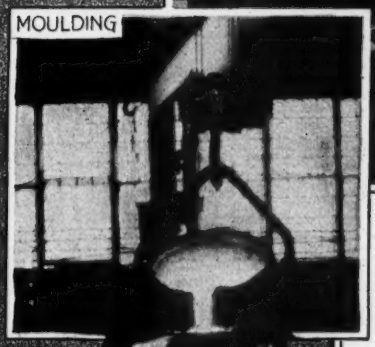
LONDON · ENGLAND

Cast Iron CULVERT PIPE





—Just One Degree Removed From The Virgin Iron Ore In The Eternal Hills

It is easy to understand why CAST IRON resists rust. It is but one degree removed from iron ore. The virgin iron ore that comes to the Blast Furnace unchanged after thousands of years in the eternal hills.

And that is why so many eminent engineers are specifying

SPI-COR
Cast Iron Spiral Corrugated Culvert Pipe

for important culvert installations. They know it is CAST IRON. They know it will resist rust. They know it will remain unchanged even after centuries of service.

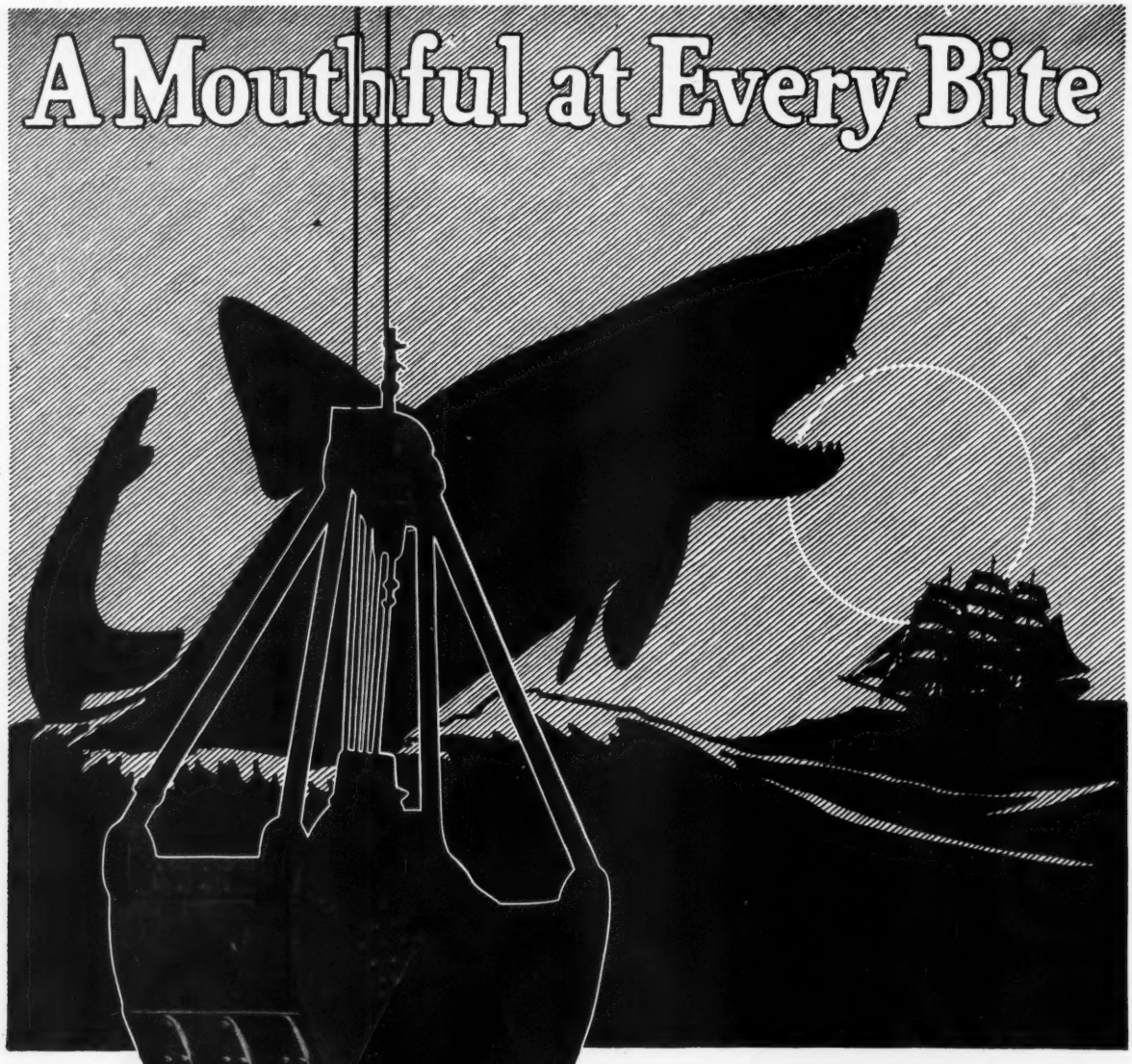
The Spiral Corrugated form in which this pipe is cast offers a number of distinct advantages, all fundamentally sound. They are explained in the new Spi-Cor booklet, a copy of which we will be glad to send you.

AMERICAN CASTING COMPANY

CULVERT PIPE HEADQUARTERS

BRANCH SALES OFFICES: 141 Milk St., Boston, Mass.: 2734 Grand Central Terminal Bldg., New York: Chemical Bldg., St. Louis, Mo.: 16 E. Broad St., Columbus, Ohio: 222 Market St., Harrisburg, Pa.: Box 265, Tyler, Texas: 308 North Greenwood Avenue, Green Bay, Wis.

A Mouthful at Every Bite



Like the man-eating shark, the powerful jaws of the Owen Type "J" Bucket force the cutting blades or teeth right through the material and get "A mouthful at every bite."

Patent design insures a good start with the jaws imbedded in the material. Concentrated weight anchors an Owen to the ground; and the block and tackle pull the head down with a tremendous push on the jaws, creating real penetrating digging power.

No matter what your requirements are . . . how special or how general . . . there's an Owen Bucket which will meet them better than any other. Write for details.

THE OWEN BUCKET CO.
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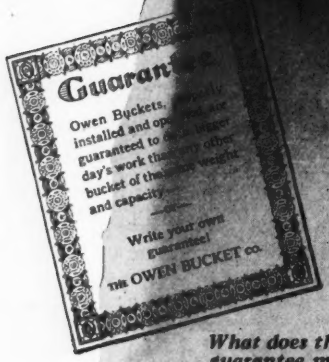


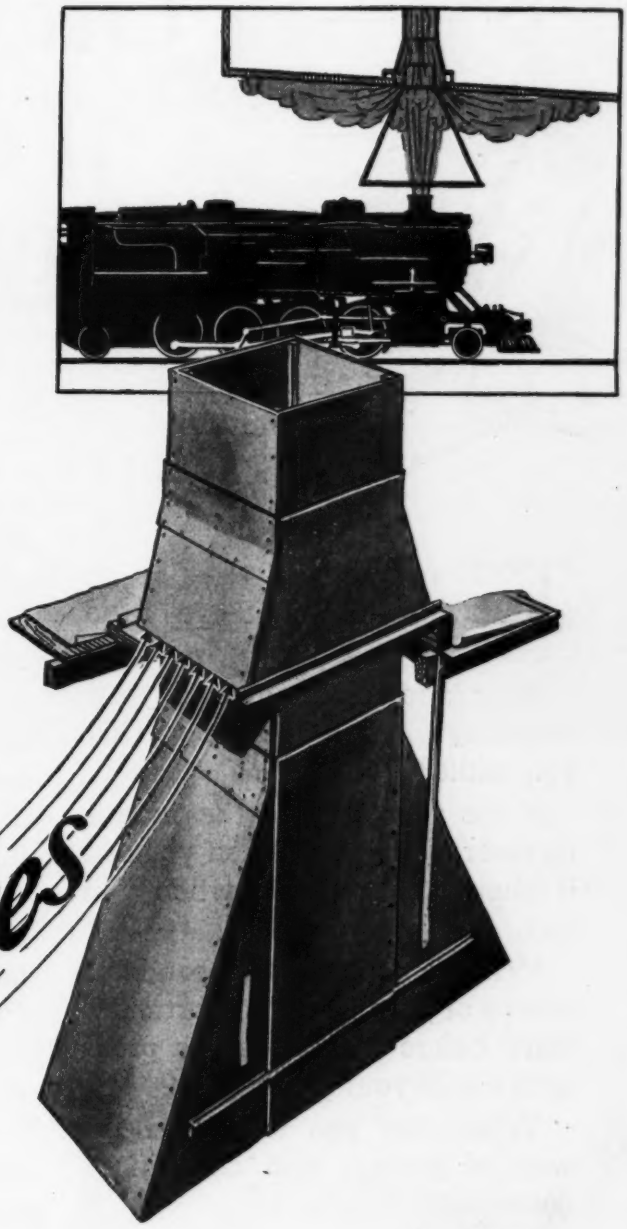
What does the above guarantee mean? It means satisfaction assured.

OWEN CLAMSHELL BUCKETS INSURE A BIGGER DAYS WORK

Owen Buckets

It's more than a smoke jack ~ it Ventilates

The ejector pump action of the ventilating type AV Johns-Manville Smoke Jack clears the entire roundhouse of smoke.



BY a unique application of the Venturi principle, the new type AV Johns-Manville Smoke Jack acts both as a smoke jack and a forced draft ventilator.

The blast of the locomotive provides the forced draft and the two openings just below the roof provide an exit for smoke escaping from the hood due to improper spotting of the locomotives.

Made of Transite Asbestos Wood, this jack is practically indestructible. It is easily assembled and installed.

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Transite Asbestos Smoke Jacks

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INSULATION
BRAKE LININGS
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You are your Credit Man When it comes to Buying Orders

THE orders you take come under the watchful eye of the credit man.

How about the orders your company places—the orders that you make?

If the reliability of the manufacturer is checked when you sell it should be checked when you buy.

Whether his is a dependable source of purchase is important to learn before—not after his products are in your plant.

What can you expect in the way of prompt and continuous deliveries?

What about quality uniformity?

Has he the ability to finance your orders?

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A reliable aid is here—in this publication. Most of the manufacturers in this issue have been running their advertising in this publication continuously year after year.

They are established. They do not advertise something they cannot deliver. They cannot deliberately exaggerate product merit or institutional service.

Why? Because this publication is A.B.P.—meaning it is a member of the Associated Business Papers. This means, broadly, that this publisher has that basic A.B.P. requirement—integrity.

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New Platforms at 76c Sq. Yd.

Write Today for the Complete Story

How the A. C. L. R. R. built new platforms of "Kyrock" at Florence, S. C., at 76c per square yard is graphically told by a series of photographs showing the surprisingly few and simple operations involved. May we send you a copy?

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Kyrock

The Perfect Pavement

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Many of the nation's leading railroads have found in Page Chain Link Fence a permanent and economical means for safeguarding right-of-way, freight yards, shops and other forms of property. Presenting a sightly, yet impassable barrier, Page eliminates trespassing, preventing property destruction by malicious intruders. Made of copper bearing steel, galvanized after weaving to resist rust.

Page engineers will gladly give you the benefit of their experience. There is a distributor in your vicinity. Write for his name and address and interesting literature. No obligation.

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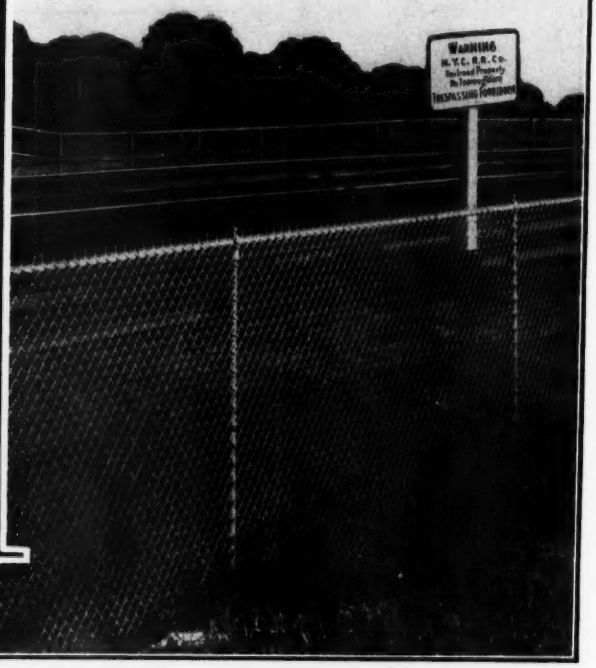
TRADE MARK
America's first wire fence-1883



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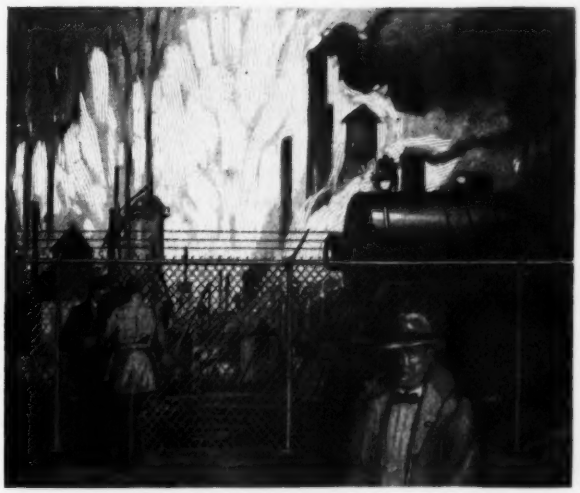

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We also manufacture Wrought Iron Fence for park, station and inter-track use.

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Cyclone Fence

REG. U.S PAT. OFF

The Mark of Dependable Property Protection

Special Design Wrought Iron Inter-Track Fence

Cyclone Complete Responsibility Means Quality Fence and Service

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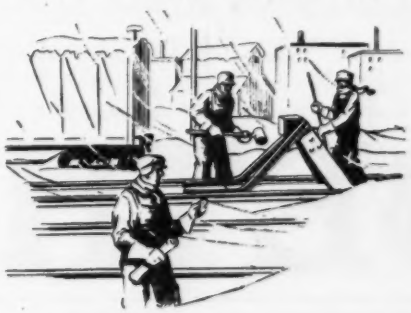
The ounce of prevention and pound of cure as applied to Bumping Posts—

The lack of a bumping post somewhere may mean a responsibility to someone else and not to you—at that the lack of one may mean a big inconvenience to you—but do your friend the favor of urging him to put bumping posts where they will save accidents and possible damage, at the ends of his spurs or switches.

Many a man has put his ounce of prevention cost in the bank and later bought a



good many pounds of cure—at a higher price per ounce.

The "Durable" is one economical post that you can put in in winter and never have to lift a **shovel full of dirt.**

—And it stops the cars.

Come to Chicago. We will show you a Durable post against which we sent a flat loaded with scrap iron at twenty miles an hour. The post is still there having needed no repairs. You can stand behind it or build a building there—safely.

Send the coupon in for further information.

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Also builders of the Ellis Bumping Post

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Please send full information and prices on Durable Bumping Post to:

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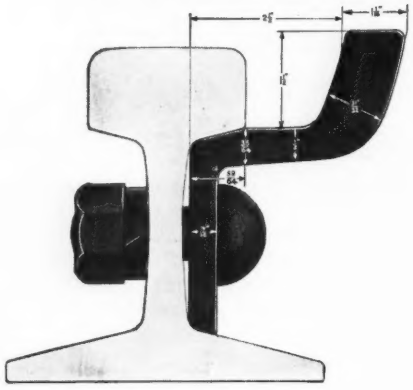
If you know of anyone else who should have a good bumping post, put his name on a piece of paper and pin the coupon to it. Thank you.

Rolled Guard Section 235 G



Rolled Guard Section 235 G is designed for use with standard tee rails on curves and in the manufacture of special trackwork. It has also found general use as a paving guard in paved streets, mill buildings, etc. The use of this guard insures a uniform flangeway for the wheel and protection to the abutting pavement.

Rolled Guard Section 235 G weighs 42 pounds per yard and is rolled to fit an 85 pound A.S.C.E. rail. It is also made to fit other sections.

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Bethlehem Steel Export Corporation, 25 Broadway, New York City, Sole Exporter of our Commercial Products

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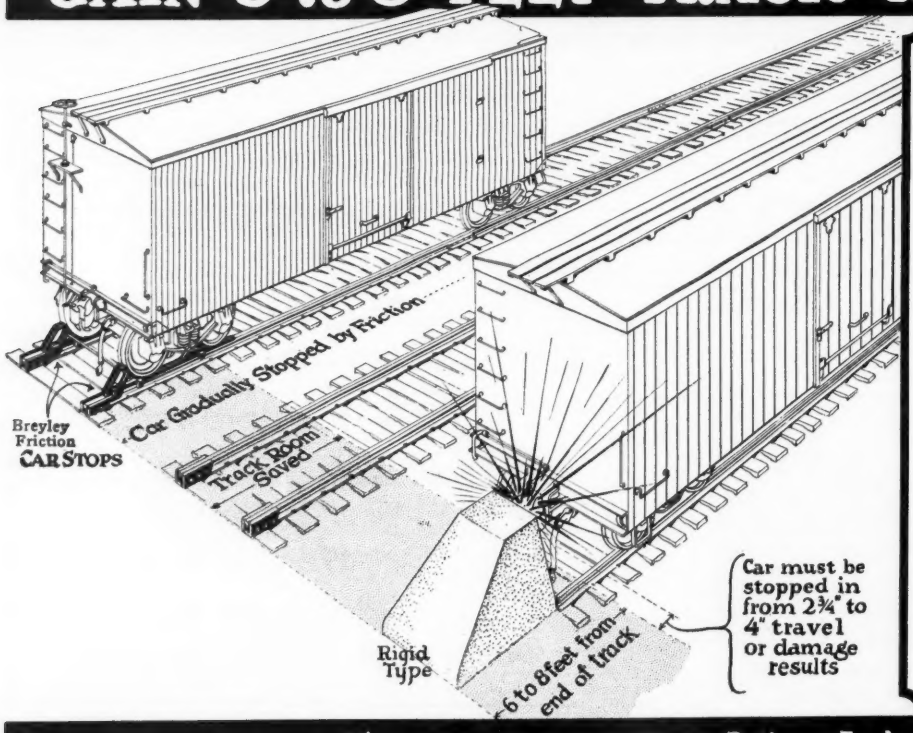
GAIN 6 to 8 FEET TRACK ROOM


Breyley Friction CAR STOPS
Car Gradually Stopped by Friction
Track Room Saved
Rigid Type
6 to 8 feet from end of track
Car must be stopped in from 2¾" to 4" travel or damage results

with "BREYLEY" FRICTION **Car Stops**

You're losing from six to eight feet of valuable track space on every track end guarded with the rigid bumping post.

Breyley Friction Car Stops allow the car wheels to come clear to the end of the track. Cars are brought to a gradual stop by friction in the last 30 to 60 feet of travel.

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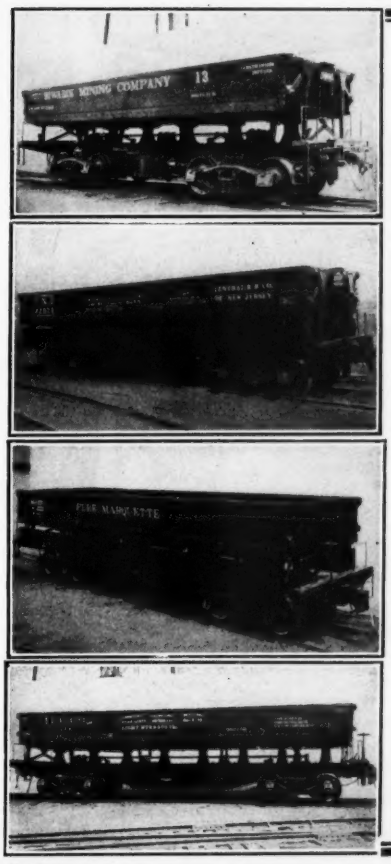

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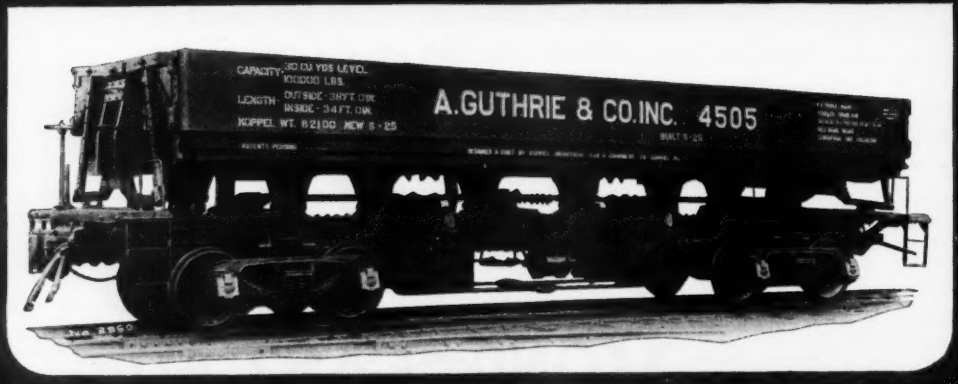

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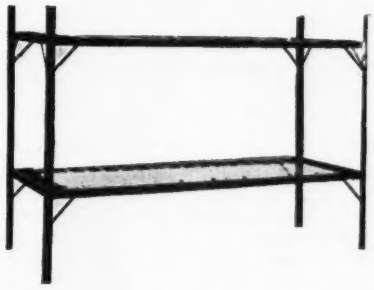

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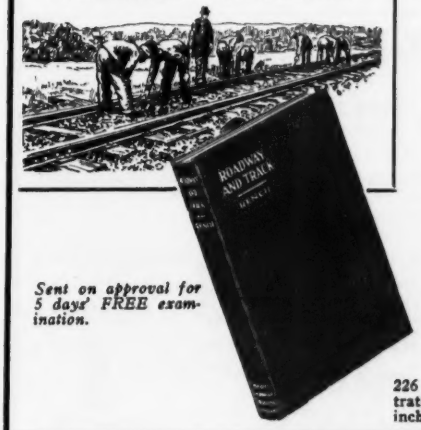

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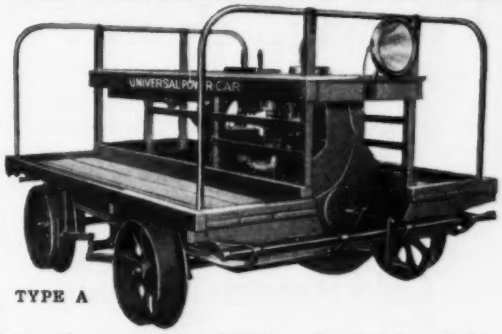

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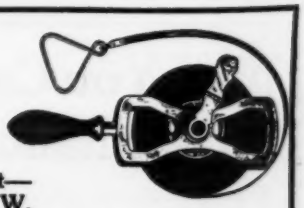

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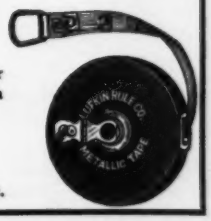

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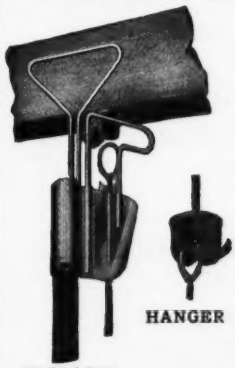

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No more tangling of tell-tales.
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Avoid death and injuries to employees.

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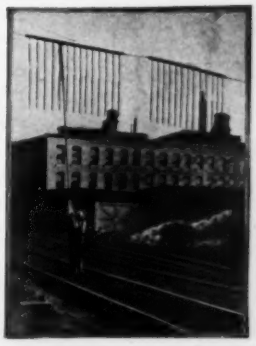

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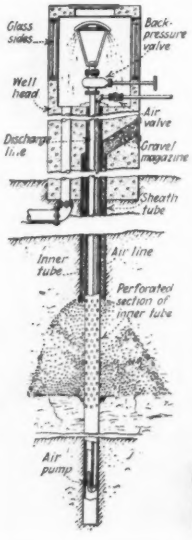

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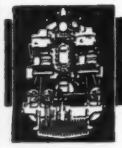

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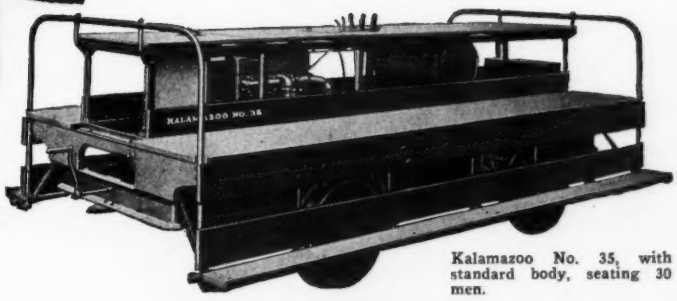

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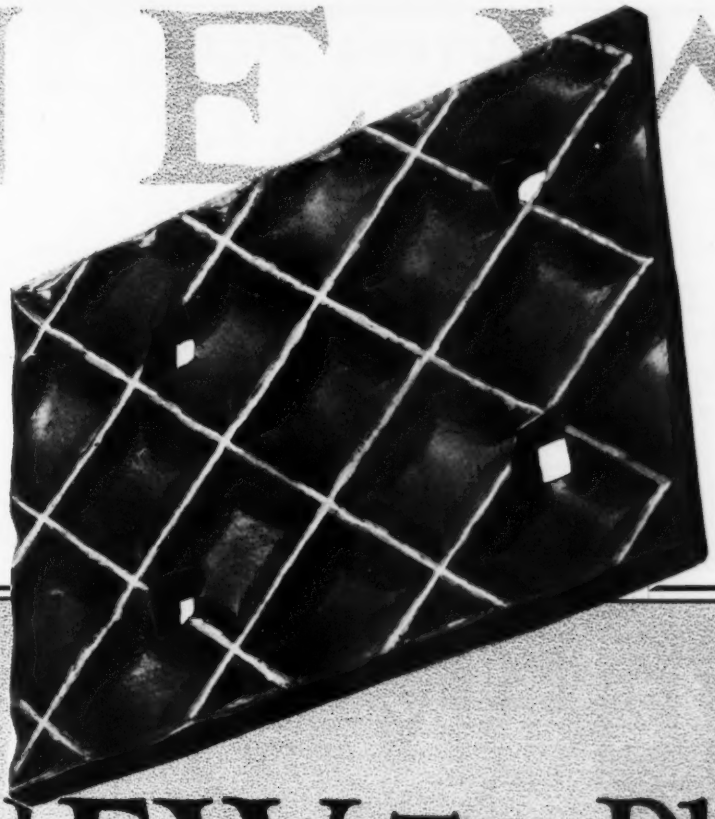

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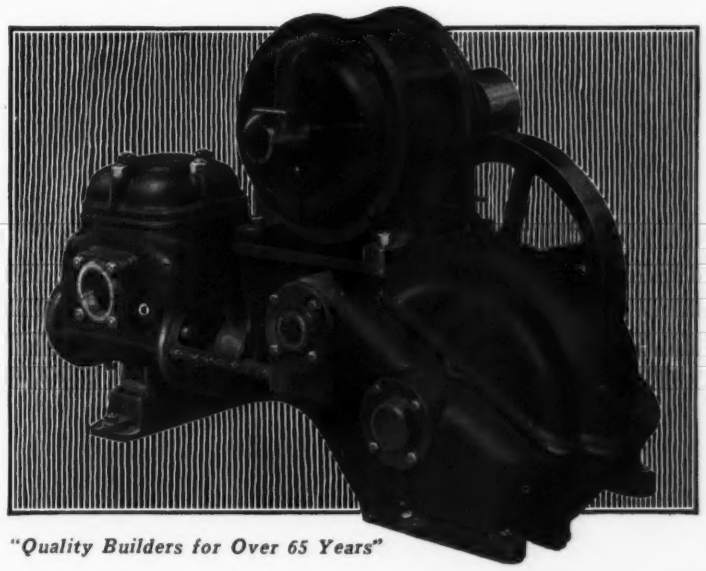

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